

# Keysight Series N5700 System DC Power Supply

User's Guide



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

### General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

### Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power. Note the instrument's external markings described under "Safety Symbols"

### Ground the Instrument

This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cover must be connected to an electrical ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

### Fuses

The instrument contains an internal fuse, which is not customer accessible.

### Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

### Do Not Remove the Instrument Cover

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

### Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Keysight Sales and Service Office for service and repair to ensure that safety features are maintained.

### In Case of Damage

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel

#### CAUTION



















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

#### WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a

**WARNING** notice until the indicated conditions are fully understood and met.

### Safety Symbols

	Direct current
	Alternating current
	Both direct and alternating current
	Three phase alternating current
	Earth (ground) terminal
	Protective earth ground terminal.
	Frame or chassis terminal
	Terminal is at earth potential.
	Neutral conductor on permanently installed equipment
	Line conductor on permanently installed equipment.
	On supply
	Off supply
	Standby supply. Unit is not completely disconnected from ac mains when switch is off
	In position of a bi-stable push switch
	Out position of a bi-stable push switch
	Caution, risk of electric shock
	Caution, hot surface
	Caution, refer to accompanying documents

## In this Book

This User's Manual contains the operating instructions, installation instructions, and specifications of the Keysight Technologies Series N5700 750W and 1500W System DC Power Supplies. Specific chapters in this manual contain the following information:

- Quick Reference – Chapter 1 is a quick reference section that helps you quickly become familiar with your Keysight N5700 power supply.
- Installation – Chapter 2 describes how to install your power supply. It describes how to connect various loads to the output. It discusses remote sensing as well as parallel and series operation.
- Operating the Power Supply Locally – Chapter 3 describes how to operate the power supply from the front panel and from the analog connector on the rear panel. It also includes a turn-on check-out procedure to verify the unit is operating properly.
- Operating the Power Supply Remotely – Chapter 4 describes how to configure the remote interfaces. It also gives a brief overview of the SCPI command structure and basic programming concepts.
- Language Reference – Chapter 5 describes all of the SCPI programming commands.
- Programming Examples – Chapter 6 provides Visual BASIC example programs that illustrate some common applications.
- Specifications – Appendix A describes specifications and supplemental characteristics.
- Verification and Calibration Procedures – Appendix B explains the verification and calibration procedures.
- Service – Appendix C describes what to do if your unit requires service.
- Compatibility – Appendix D documents the compatibility commands of the Keysight 603xA power supplies that are supported by the Keysight N5700 power supplies.

### NOTE

You can contact Keysight Technologies at one of the following telephone numbers for warranty, service, or technical support information.

In the United States: (800) 829-4444

In Europe: 31 20 547 2111


In Japan: 0120-421-345

Or use our Web link for information on contacting Keysight in your country or specific location: [www.keysight.com/find/assist](http://www.keysight.com/find/assist)

Or contact your Keysight Technologies Representative.

The web contains the most up to date version of the manual. Go to <http://www.keysight.com/find/N5700> to get the latest version of the manual.

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# 1

## Quick Reference

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This chapter concisely describes the Keysight Technologies Series N5700 Power Supplies.

This chapter is not meant to describe every operating feature in detail. It is simply a quick reference guide to quickly become familiar with the essential components of the power supply. It can also be used as a memory jogger for experienced users to quickly find a front/rear panel function.

A quick reference programming command chart is included in the beginning of chapter 5.

## The Keysight N5700 DC Power Supplies – At a Glance

The Keysight Technologies Series N5700 System DC Power Supplies are general-purpose, 1U (rack unit) high, switching power supplies that are available with a wide variety of output voltage and current ratings.

These power supplies are power-factor corrected and operate from a worldwide AC voltage range. Output voltage and current are continuously displayed and LED indicators show the complete operating status of the power supply.

The front panel controls allow the user to set the output parameters, over-voltage, under-voltage, and over-current protection levels, and preview the settings.

The rear panel includes the necessary connectors to control and monitor the power supply operation by analog signals or by the built-in remote communication interfaces.

### Output Features

- Constant voltage/constant current with automatic crossover.
- High-resolution voltage and current front panel controls.
- Accurate voltage and current readback.
- Independent edge-triggered external shut-off, and level-triggered external enable/disable.
- Parallel master/slave operation with active current sharing.
- Remote sensing to compensate for voltage drop in load leads.
- Analog output programming and monitoring.

### System Features

- Built-in GBIB/LAN/USB interface.
- A built-in Web server that lets you control the instrument directly from an internet browser on your computer.
- Zero-gap stacking - no ventilation holes at the top and bottom surface of the power supply.
- Universal input voltage with active power factor correction.
- Fan speed control for low noise and extended fan life.

## Programmable Functions

- Output voltage and current setting.
- Output voltage and current measurement.
- Output voltage and current trigger setting.
- Output On/Off control.
- Over-current protection setting.
- Over-voltage protection setting and readback.
- Under-voltage limit setting and readback.
- Start-up mode (either last setting or reset mode)
- Status register setting and readback.
- Bus trigger
- Calibration

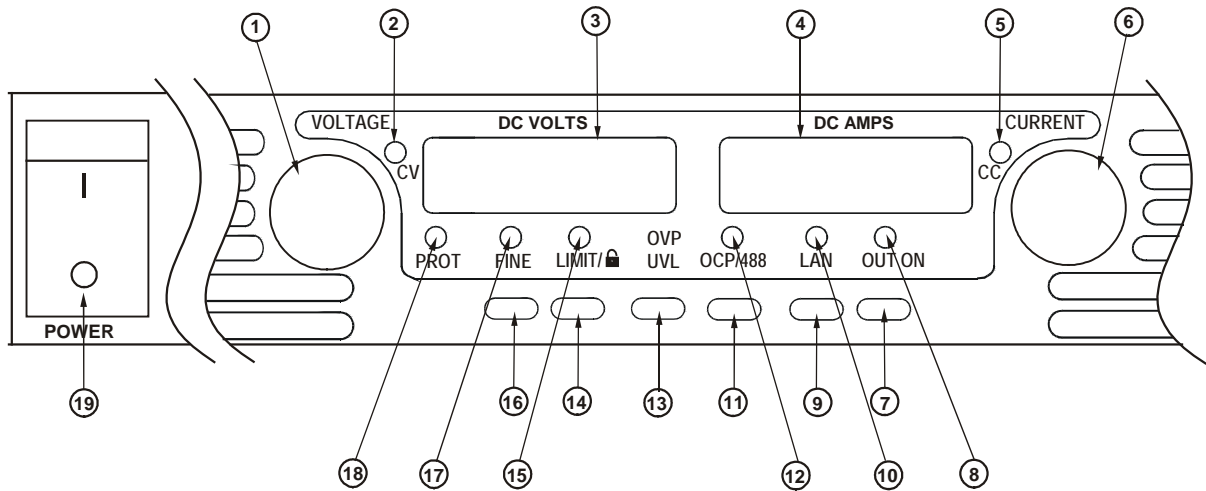
## Model Ratings

Model	Voltage Range	Current Range	Model	Voltage Range	Current Range
N5741A	0 – 6V	0 – 100A	N5761A	0 – 6V	0 – 180A
N5742A	0 – 8V	0 – 90A	N5762A	0 – 8V	0 – 165A
N5743A	0 – 12.5V	0 – 60A	N5763A	0 – 12.5V	0 – 120A
N5744A	0 – 20V	0 – 38A	N5764A	0 – 20V	0 – 76A
N5745A	0 – 30V	0 – 25A	N5765A	0 – 30V	0 – 50A
N5746A	0 – 40V	0 – 19A	N5766A	0 – 40V	0 – 38A
N5747A	0 – 60V	0 – 12.5A	N5767A	0 – 60V	0 – 25A
N5748A	0 – 80V	0 – 9.5A	N5768A	0 – 80V	0 – 19A
N5749A	0 – 100V	0 – 7.5A	N5769A	0 – 100V	0 – 15A
N5750A	0 – 150V	0 – 5A	N5770A	0 – 150V	0 – 10A
N5751A	0 – 300V	0 – 2.5A	N5771A	0 – 300V	0 – 5A
N5752A	0 – 600V	0 – 1.3A	N5772A	0 – 600V	0 – 2.5A

Minimum output voltage is  $\leq 0.2\%$  of the rated output voltage.

Minimum output current is  $\leq 0.4\%$  of the rated output current.

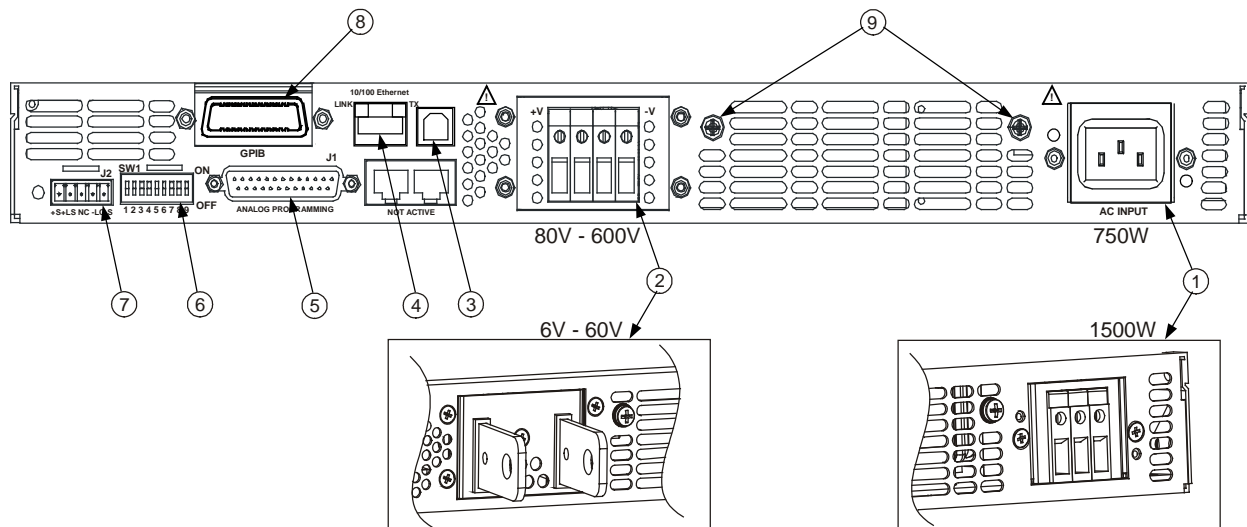
## The Front Panel - At a Glance



- 1 – VOLTAGE knob**      Voltage function: Adjusts the output voltage, the over-voltage protection level, and the under-voltage limit. If over-voltage protection or under-voltage limits have been set, you cannot program the output voltage outside those limits.  
GPIO address: Selects the GPIO address when OCP/488 is pressed and held.
- 2 – CV indicator**      When lit, indicates that the unit is operating in constant voltage mode – with the output voltage being held constant.
- 3 – DC VOLTS display**      LED display that normally displays the voltage measured at the sense terminals. When LIMIT is pressed, the display indicates the programmed voltage setting. When OVP/UVL is pressed, the display indicates either the OVP or UVL setting. When OCP/488 is pressed and held, the display indicates the GPIO address. When LAN is pressed and held, the display indicates the IP and Ethernet address.
- 4 – DC AMPS display**      LED display that normally displays the current measured at the output terminals. When LIMIT is pressed, the display indicates the programmed current setting. When LAN is pressed and held, the display indicates the IP and Ethernet address.
- 5 – CC indicator**      When lit, indicates that the unit is operating in constant current mode – with the output current being held constant.
- 6 – CURRENT knob**      Adjusts the output current.
- 7 – OUT ON button**      Output function: Press OUT ON to turn the output on or off. Press OUT ON to reset and turn the output on after an OVP or OCP event has occurred.  
Start-up function: Selects between Safe-Start and Auto-Restart modes. Press and hold the OUT ON button to toggle between Safe-Start and Auto-Restart. The display cycles between SAF and AU7. Releasing the OUT ON button while one of the modes is displayed selects that mode.
- 8 – OUT ON indicator**      When lit, indicates that the output is enabled or on.

- 9 – LAN button** View address: Press LAN to view the IP and Ethernet address. The display first scrolls through the four segments of the IP address, followed by the six segments of the Ethernet (EA) address. Press any key to turn the address display off.
- Reset address: Press and hold the LAN button for three seconds. Pressing the LAN button again while the message “LAN rES” is displayed resets the LAN configuration to the factory-shipped settings (see chapter 4 for settings). If the key is not pressed again, the display returns to normal and the configuration is not changed.
- 10 – LAN indicator** When lit, indicates that the LAN has been configured and is operating normally. When blinking, identifies the unit for which the indicator has been set to blink by the unit’s Web home page.
- 11 – OCP/488 button** Enable OCP: Press OCP/488 to turn over-current protection on. Press OCP/488 again to turn over-current protection off.
- Reset OCP: When an over-current protection event occurs, press the OUT ON button to enable the output and re-arm over-current protection.
- GPIB address: Press and hold the OCP/488 button for three seconds. This lets you set the GPIB address with the Voltage knob.
- 12 – OCP indicator** When lit, indicates that over-current protection is enabled or on.
- 13 – OVP/UVL button** OVP function: Press OVP/UVL once to set the over-voltage protection level with the Voltage knob (the display shows OUP). You cannot set the over-voltage protection lower than about 5% above the present output voltage setting.
- UVL function: Press OVP/UVL twice to set the under-voltage programming limit with the Voltage knob (the display shows UUL). You cannot set the under-voltage protection higher than about 5% below the present output voltage setting.
- 14 – LIMIT button** Limit function: Press LIMIT to display the output voltage and current limit. For five seconds the display shows the settings and then it returns to show the actual output voltage and current.
- Lock function: Press and hold the LIMIT button to toggle between Locked front panel and Unlocked front panel. The display will cycle between LFP and UFP. Releasing the LIMIT button while one of the modes is displayed selects that mode. If the display indicates rLFP, the front panel has been locked by a remote programming command.
- 15 – LIMIT indicator** When lit, indicates that the LIMIT button is pressed.
- 16 – FINE button** Selects Fine or Coarse adjustment control. In Fine mode, the Voltage and Current knobs operate with high resolution; in Coarse mode, with lower resolution (approximately six turns).
- 17 – FINE indicator** When lit, indicates that the unit is in Fine adjustment mode.
- 18 – PROT indicator** When blinking, indicates that a fault has occurred. OVP, OCP, OTP, Enable fail, and AC fail detection will cause the PROT indicator to blink. The PROT indicator may blink and the display indicate AC for a few seconds after the unit is turned off because of residual energy inside the unit.
- 19 – POWER switch** Turns the power supply on or off.

## The Rear Panel – At a Glance



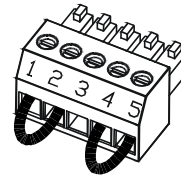
- |                                  |   |
|----------------------------------|---|
| 1 – AC input connector           | Wire clamp connector for 1500W output models.<br>IEC connector for 750W output models.  |
| 2 – DC output connector          | Wire clamp connector for 80V to 600V models.<br>Bus bars for 6V to 60V models.  |
| 3 – USB connector                | Connector for connecting to a USB interface. See chapter 4 for setup.   |
| 4 – LAN connector                | Connector for connecting to a LAN interface. LINK LED indicates link integrity. TX LED indicates LAN activity. See chapter 4 for LAN setup.   |
| 5 – Analog Programming connector | Connector for the analog interface. Includes output voltage and current limit programming and monitoring signals, Shut-Off control (electrical signal), Enable/Disable control (dry-contact), power supply ok (Power Supply OK) signal and operation mode (CV/CC) signal. (See next page for details) |
| 6 – SW1 setup switch             | Nine-position switch for selecting remote programming and monitoring modes for Output Voltage, Current Limit and other control functions. (See next page for details)   |
| 7 – Remote Sense connector       | Connector for making remote sensing connections for regulating the load voltage and compensating for wiring voltage drop. (See next page for details)   |
| 8 – GPIB connector               | Connector for connecting to a GPIB interface. See chapter 4 for setup.  |
| 9 – Ground screw                 | M4x8 screws for making chassis ground connections   |

**WARNING**

**SHOCK HAZARD** The power cord provides a chassis ground through a third conductor. Be certain that your power outlet is of the three-conductor type with the correct pin connected to earth ground

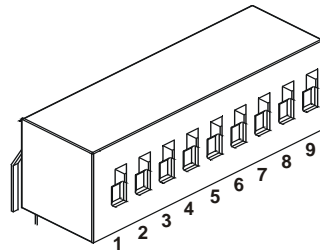
## J2 Sense Connector

- 1 – Remote sense (+)
- 2 – Local sense (+)
- 3 – Not used
- 4 – Local sense (-)
- 5 – Remote sense (-)



The factory-shipped configuration is shown in the figure.

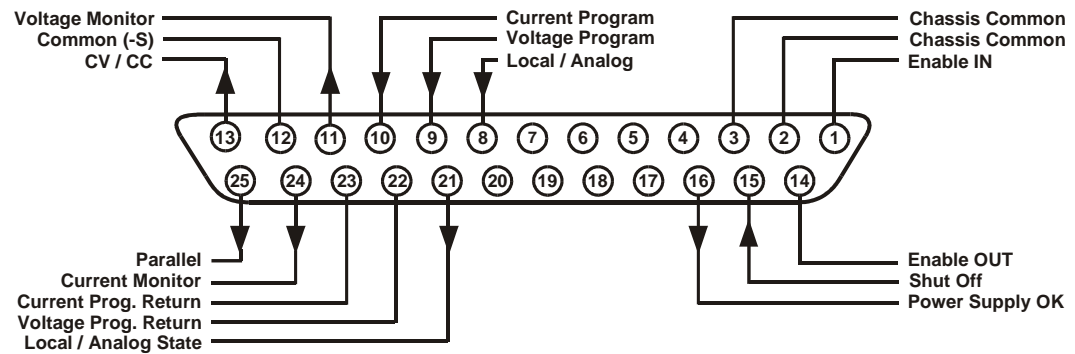
## SW1 Setup Switch



The factory-shipped setting is Down for all switches.

- |  |   |
|--|---|
| 1 – Output voltage, voltage programming    | <p><u>Down</u>: The output voltage is programmed by the front panel.</p> <p><u>Up</u>: The output voltage is programmed by the external voltage signal.</p>                       |
| 2 – Output current, current programming    | <p><u>Down</u>: The output current is programmed by the front panel.</p> <p><u>Up</u>: The output current is programmed by the external voltage signal.</p>                       |
| 3 – Programming range (voltage/resistance) | <p><u>Down</u>: The remote programming range is: 0 – 5V / 0 – 5K<math>\Omega</math>.</p> <p><u>Up</u>: The remote programming range is: 0 – 10V / 0 – 10K<math>\Omega</math>.</p> |
| 4 – Voltage and Current monitoring range   | <p><u>Down</u>: The remote monitoring range is: 0 – 5V.</p> <p><u>Up</u>: The remote monitoring range is: 0 – 10V.</p>  |
| 5 – Shut-Off Logic Select                  | <p><u>Down</u>: OUT OFF = Low (0 – 0.6V) or short; OUT ON = High (2V – 15V) or open.</p> <p><u>Up</u>: OUT OFF = High (2V – 15V) or open; OUT ON = Low (0 – 0.6V) or short.</p>   |
| 6 – Not Used                               |   |
| 7 – Output voltage, resistive programming  | <p><u>Down</u>: The output voltage is programmed by the front panel.</p> <p><u>Up</u>: The output voltage is programmed by the external resistor.</p>                             |
| 8 – Output current, resistive programming  | <p><u>Down</u>: The output current is programmed by the front panel.</p> <p><u>Up</u>: The output current is programmed by the external resistor.</p>                             |
| 9 – Enable/Disable control                 | <p><u>Down</u>: The J1 Enable+/Enable– pins are not active.</p> <p><u>Up</u>: The J1 Enable+/Enable– pins are active.</p>   |

## J1 Analog Programming Connector




The factory-shipped default configuration is Local operation, which does not require connection to J1.

Pin 1:	<b>Enable IN</b>	Connect Pin 1 to Pin 14 to enable the output. Disconnect to disable the output.
Pin 2, 3:	<b>Chassis Common</b>	Signal return for Pin 15 and Pin 16. Connected to chassis.
Pin 4-7:	<b>Not Used</b>	No connection
Pin 8:	<b>Local/Analog</b>	Input for selecting between front panel or analog programming of the output.
Pin 9:	<b>Voltage Program</b>	Input for voltage or resistance programming of the output voltage.
Pin 10:	<b>Current Program</b>	Input for voltage or resistance programming of the output current.
Pin 11:	<b>Voltage Monitor</b>	Output for monitoring the output voltage.
Pin 12:	<b>Common</b>	Signal return for Pin 8, Pin11, Pin 13, and Pin 24. Connected internally to -S.
Pin 13:	<b>CV/CC</b>	Output for constant voltage/constant current mode indication.
Pin 14:	<b>Enable OUT</b>	Connect Pin 14 to Pin 1 to enable the output. Disconnect to disable the output.
Pin 15:	<b>Shut Off</b>	Input for Shut-Off control of the output. Referenced to Chassis Common.
Pin 16:	<b>Power Supply OK</b>	Output to indicate the power supply status. Referenced to Chassis Common.
Pin 17-20:	<b>Not Used</b>	No connection
Pin 21:	<b>Local/Analog State</b>	Output for indication of local or analog programming mode.
Pin 22:	<b>Voltage Prog. Return</b>	Signal return for Pin 9. Connected internally to -S.
Pin 23:	<b>Current Prog. Return</b>	Signal return for Pin 10. Connected internally to -S.
Pin 24:	<b>Current Monitor</b>	Output for monitoring the output current.
Pin 25:	<b>Parallel</b>	Output for current balancing in parallel operation.



# 2 Installation

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This chapter describes how to install your power supply. It discusses installation, rack mounting, and line cord connections.

This chapter also discusses how to connect your load to the output terminals. It discusses what you need to know about wire sizes and how to compensate for voltage drops in the load leads. It also discusses various loads configurations and how to connect units in series and parallel.

Before getting started, check the list under “Items Supplied” and verify that you have received these items with your instrument. If anything is missing, please contact your nearest Keysight Sales and Service Office.

## General Information

### Models

750 W Models	1500 W Models
N5741A – N5749A	N5761A – N5769A
N5750A – N5752A	N5770A – N5772A

### Items Supplied

Item	Description
Power Cord	A power cord appropriate for your location 750W units are supplied with terminated power cords 1500W units are supplied with unterminated power cords
Strain relief assembly	A strain relief assembly for unterminated power cords (only used for 1500W units)
AC input cover	A cover for the AC input on which the strain relief assembly is mounted (only used for 1500W units)
Analog connector	A DB25 subminiature connector plug for analog control connections
Shield assembly	A safety shield for the output terminal connections
Hardware	Nuts, washers, and bolts for connecting load leads to output bus bars (only used for 6V to 60V units)
Documentation Set	Contains User's Guide with Product Reference CD-ROM
Certificate of Calibration	A certificate of calibration referenced to the serial number
Automation-Ready CD-ROM	E2094N - contains Keysight IO Libraries Suite

### Accessories

Item	Description
N5740A	Rack-mount slide kit for installing in system II cabinets

## Inspecting the Unit

When you receive your power supply, inspect it for any obvious damage that may have occurred during shipment. If there is damage, notify the shipping carrier and nearest Keysight Sales and Service Office immediately. Refer to Appendix C for more information.

Until you have checked out the power supply, save the shipping carton and packing materials in case the unit has to be returned.

## Installing the Unit

### Safety Considerations

This power supply is a Safety Class 1 instrument, which means it has a protective earth terminal. That terminal must be connected to earth ground through power source equipped with a ground receptacle. Refer to the Safety Summary page at the beginning of this guide for general safety information. Before installation or operation, check the power supply and review this guide for safety warnings and instructions. Safety warnings for specific procedures are located at appropriate places throughout this Guide.

### Environment

**WARNING**

Do not operate the instrument in the presence of flammable gasses or fumes

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The environmental conditions, dimensions of the instrument, as well as an outline diagram are given in Appendix A. Basically, the instrument should only be operated indoors in a controlled environment. Do not operate the power supply in an area where the ambient temperature exceeds 40° C.

**NOTE**

Keysight N5700 power supplies generate magnetic fields, which may affect the operation of other instruments. If your equipment is susceptible to magnetic fields, do not position it adjacent to the power supply.

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### Airflow

Fans cool the power supply by drawing air through the front and exhausting it out the back. The instrument must be installed in a location that allows sufficient space of at least 10 cm (4 in) at the front and back of the unit for adequate air circulation.

## Rack Installation

**CAUTION**

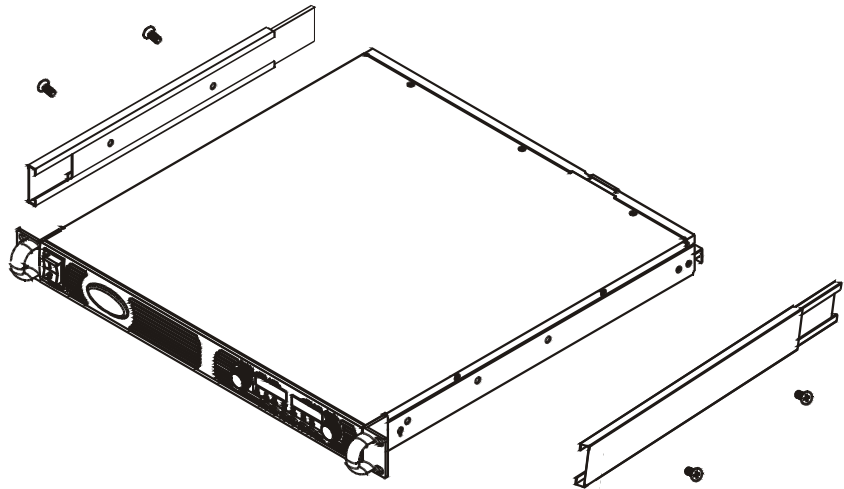
Ensure that the screws used to attach the rack slide kit do not penetrate more than 6 mm into the sides of the unit.

Do not block the air intake at the front, or the exhaust at the rear of the unit.

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The Keysight N5700 power supplies can be mounted in a standard 19-inch rack panel or cabinet. They are designed to fit in one rack unit (1U) of space. To install the power supply in a rack:

1. Use the front panel rack-mount brackets to install the power supply in the rack.
2. Use a support bracket to provide adequate support for the rear of the power supply.
3. If using rack mount slides, use Keysight N5740A Rack-mount Slide Kit to install the unit in a standard 19-inch equipment rack. Refer to the following figure for assembly instructions. Use two #10-32 x 3/8 in (max.) screws at each side. To prevent internal damage, use the specified screw length only.



## Cleaning

**WARNING**

**SHOCK HAZARD** To prevent electric shock, unplug the unit before cleaning.

---

Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

## Connecting the Line Cord

**WARNING** **SHOCK HAZARD** The power cord provides a chassis ground through a third conductor. Be certain that your power outlet is of the three-conductor type with the correct pin connected to earth ground.

**FIRE HAZARD** Use only the power cord that was supplied with your instrument. Using other types of power cords may cause overheating of the power cord, resulting in fire.

---

**NOTE** The detachable power cord may be used as an emergency disconnecting device. Removing the power cord will disconnect ac input power to the unit.

---

The AC input on the back of your unit is a universal AC input. It accepts line voltages in the range of 85 VAC to 265 VAC. The frequency range is 47 Hz to 63 Hz.

The input current requirement of 750W units is 10.5A @ 100 VAC nominal and 5A @ 200 VAC nominal. The current requirement of 1500W units is 21A @ 100 VAC nominal and 11A @ 200 VAC nominal.

### Input Connections for 750W units

Connect the power cord to the IEC 320 connector on the rear of the unit. The IEC connector provides the safety ground connection when the AC cord is plugged into a grounded AC receptacle.

If the wrong power cord was shipped with your unit, contact your nearest Keysight Sales and Service Office.

### Input Connections for 1500W units

**CAUTION** Connection of this power supply to an AC power source should be made by a qualified electrician or other qualified personnel.

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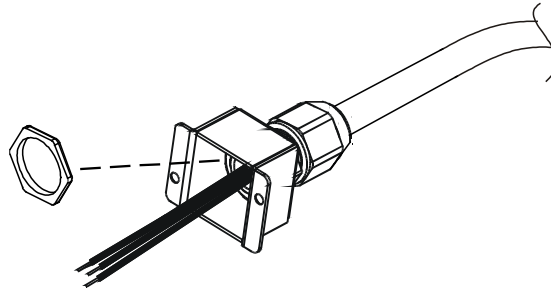
The AC input connector is a 3-terminal wire clamp located on the rear panel. Use suitable wires and tightening torque as follows:

- Wire diameter: 12 AWG or 10 AWG
- Tightening torque: 6.5 - 7.0 in-lb

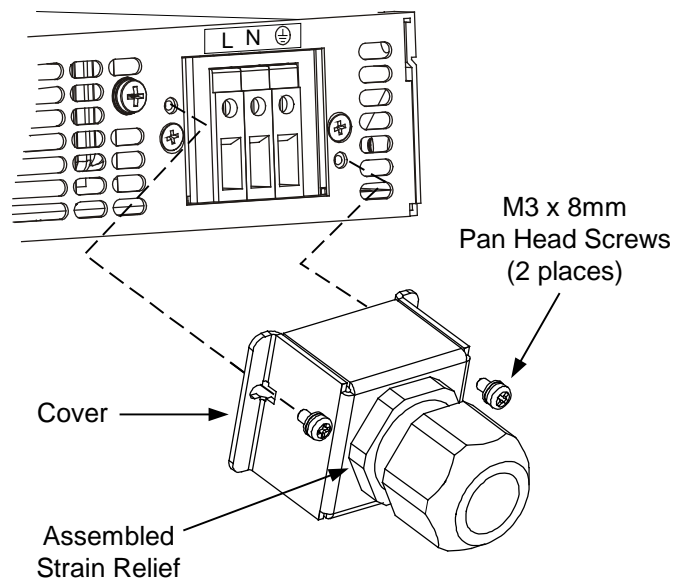
Connect the cable to the AC input connector as follows:

- Strip the outside insulation of the AC cable approximately 10 cm (4 in). Trim the wires so that the ground wire is 10 mm (0.4 in) longer than the other wires. Strip 14 mm (0.55 in) at the end of each of the wires.

- Unscrew the base of the strain relief from the wire compression nut. Place the locknut inside the AC input cover with the flat side of the nut against the cover. Insert the base through the outside opening of the AC input cover. Screw the base securely onto the locknut from the outside (17 in-lbs).
- Slide the wire compression nut over the AC cable. Insert the stripped wires through the strain relief base until the outer cable jacket is flush with the inside edge of the base. Place a wrench on the base to keep it from turning. Now tighten the compression nut to the base (14-16.2 in-lbs) while holding the cable in place. Now the cable is securely fastened inside the strain relief. Refer to the following figure.



- Route the AC wires to the input connector terminals as required. To connect the wires, loosen the terminal screw, insert the stripped wire into the terminal, and tighten the screw securely to between 4.4-5.3 in-lbs.
- Route the wires inside the cover to prevent pinching. Fasten the cover to the unit using the M3 x 8mm pan head screws provided (4.8 in-lbs). Refer to the following figure for details.



## Connecting the Load

**WARNING** **SHOCK HAZARD** Turn off AC power before making rear panel connections. All wires and straps must be properly connected with screws securely tightened.

As further explained in this section, the following factors should be considered when selecting wiring to connect the load to the power supply:

- Current carrying capacity of the wire
- Insulation rating of the wire should be at least equivalent to the maximum output voltage of the power supply
- Maximum wire length and voltage drop
- Noise and impedance effects of the load wiring

### Wire Size

**WARNING** **FIRE HAZARD** To satisfy safety requirements, select a wire size heavy enough not to overheat while carrying the power supply load current at the rated load, or the current that would flow in the event the load wires were shorted, whichever is greater.

Along with conductor temperature, you must also consider voltage drop when selecting wire sizes. The following chart lists the resistance for various wire sizes and also the maximum lengths to limit the voltage drop to 1.0 volt for various currents.

Although the power supply will compensate for up to 5V in each load wire, it is recommended to minimize the voltage drop to less than 1V to prevent excessive output power consumption from the power supply and poor dynamic response to load changes.

Wire size AWG	Resistance $\Omega$ /1000 foot	Maximum length in feet to limit voltage to 1 V				
		for 5 A	for 10 A	for 20A	for 50A	for 150A
14	2.526	80	40	20	8	2
12	1.589	120	60	30	12	3.4
10	0.9994	200	100	50	20	6
8	0.6285	320	160	80	32	10
6	0.3953	500	250	125	50	16
4	0.2486	800	400	200	80	26
2	0.1564	1200	600	300	125	40
0	0.0983	2000	1000	500	200	68

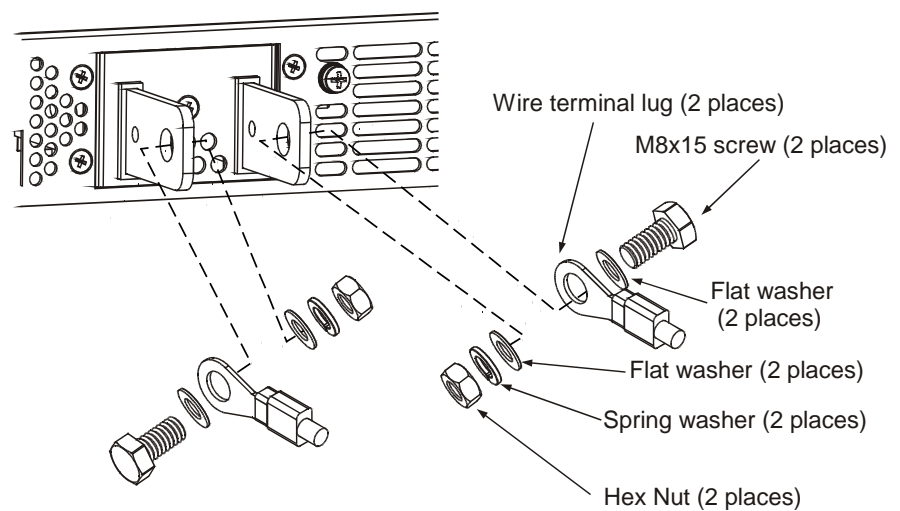
Cross section (mm <sup>2</sup> )	Resistance $\Omega$ /kilometer	Maximum length in meters to limit voltage to 1 V				
		for 5 A	for 10 A	for 20A	for 50A	for 150A
2.5	8.21	24.0	12.0	6.0	2.4	0.8
4	5.09	39.2	18.6	9.8	4.0	1.4
6	3.39	59.0	29.4	14.8	5.8	2.0
10	1.95	102	51.2	25.6	10.2	3.4
16	1.24	160	80.0	40.0	16.0	5.4
25	0.795	250	125	62.0	25.2	8.4
35	0.565	354	177	88.0	35.4	11.8

## Load Connections for 6V to 60V Models

**WARNING** SHOCK HAZARD Hazardous voltages may exist at the outputs and the load connections when using a power supply with a rated output greater than 40V. To protect personnel against accidental contact with hazardous voltages, ensure that the load and its connections have no accessible live parts. Ensure that the load wiring insulation rating is greater than or equal to the maximum output voltage of the power supply.

**CAUTION** Ensure that the load wiring mounting hardware does not short the output terminals. Heavy connecting cables must have some form of strain relief to prevent loosening the connections or bending the bus-bars.

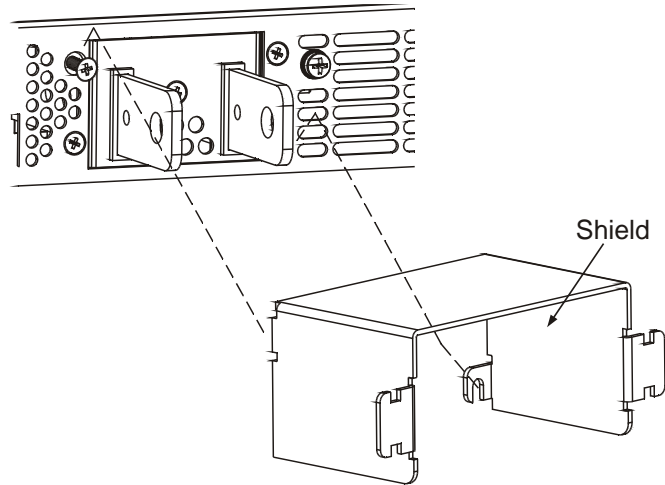
All load wires should be properly terminated with wire terminals securely attached. Do not use unterminated wires for load connections at the power supply. The following figures illustrate how to connect the load wires to the power supply bus-bars as well as how to mount the bus-bar shield to the chassis.



Screws tightening torque: 104-118 in-lb.



Install the shield after you have finished connecting the load wires.



## Load Connections for 80V to 600V Models

### WARNING

**SHOCK HAZARD** Hazardous voltages may exist at the outputs and the load connections when using a power supply with a rated output greater than 40V. To protect personnel against accidental contact with hazardous voltages, ensure that the load and its connections have no accessible live parts. Ensure that the load wiring insulation rating is greater than or equal to the maximum output voltage of the power supply.

The 80V to 600V models have a four-terminal wire clamp output connector. The two left terminals are the positive outputs and the two right terminals are the negative outputs. The connector specifications are as follows:

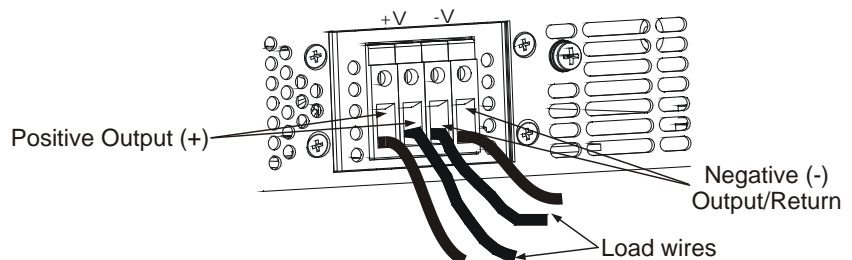
**Wire Size:** AWG 18 to AWG 10

**Stripping Length:** 10 mm (0.39 in.)

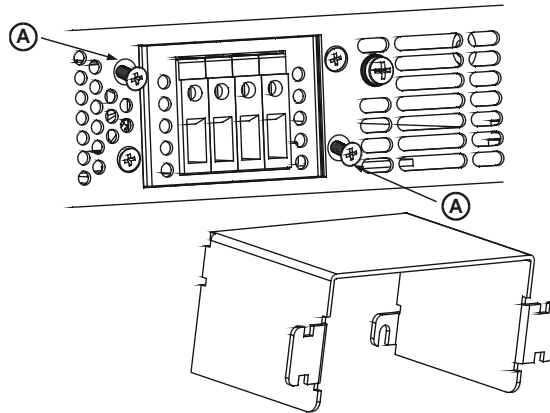
**Torque:** 6.5 - 7 in-lb.

The following instructions describe how to connect the load wires to the power supply:

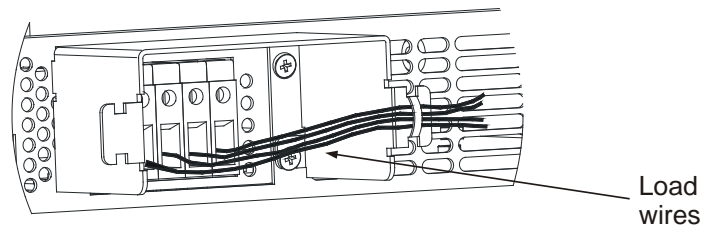
- Strip wires back approximately 10 mm (0.39 in).
- Loosen the connector terminal screws and insert the stripped wires into the terminal. Tighten the terminal screw securely.



- Loosen the two chassis screws marked A halfway.
- Assemble the protective shield to the chassis and tighten the two screws to fix the shield to the chassis. Screw tightening torque: 4.8-5.3 in-lb



- Tighten the wires to one of the shield sides using tie-wrap or equivalent. Refer to the following figure.



- Ensure that the wire length inside the shield is long enough to provide proper strain relief.

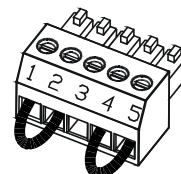
## Output Voltage Sensing

### WARNING

**SHOCK HAZARD** There is a potential shock hazard at the sense connector when using a power supply with a rated output greater than 40V. Ensure that the local sense and remote sense wiring insulation rating is greater than or equal to the maximum output voltage of the power supply. Ensure that the connections at the load end are shielded to prevent accidental contact with hazardous voltages.

Local and remote sense connections are made at the J2 connector. The connector has a removable plug that makes it easy for you to make your wire connections. Refer to the following figure for the terminal assignments.

- 1 Remote sense (+)
- 2 Local sense (+)
- 3 Not connected
- 4 Local sense (-)
- 5 Remote sense (-)

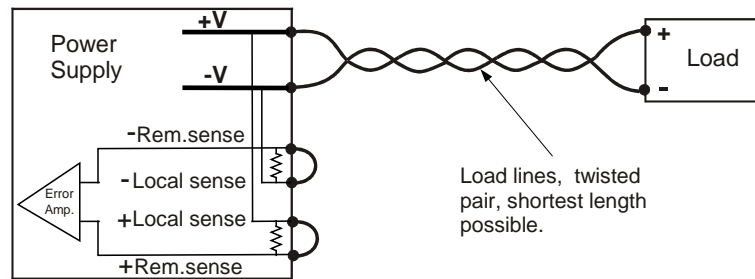


The J2 connector plug specifications are as follows:

<b>Plug Type:</b>	MC 1.5/5-ST-3.81, Phoenix
<b>Wire Size:</b>	AWG 28 to AWG 16
<b>Stripping Length:</b>	7 mm (0.28 in.)
<b>Torque:</b>	0.22 – 0.25 Nm (1.95 – 2.21 in-lb.)

## Local Sensing

The power supply is shipped with the rear panel J2 sense connector wired for local sensing of the output voltage. With local sensing, the output voltage regulation is made at the output terminals. This method does not compensate for voltage drop on the load wires, therefore it is recommended only for low load current applications or where the load regulation is less critical. The following figure illustrates the internal connections of the J2 connector.



### NOTE

If the power supply is operated without the local sense jumpers or without the remote sense lines connected, it will continue to work, but the output voltage regulation will be degraded. Also, the OVP circuit may activate and shut down the power supply.

## Remote Sensing

Use remote sensing in applications where load regulation at the load is critical. Remote sensing allows the power supply to compensate for the voltage drop in the load leads. See Appendix A under Remote Sense Compensation for the maximum allowable voltage drop on the load wires.

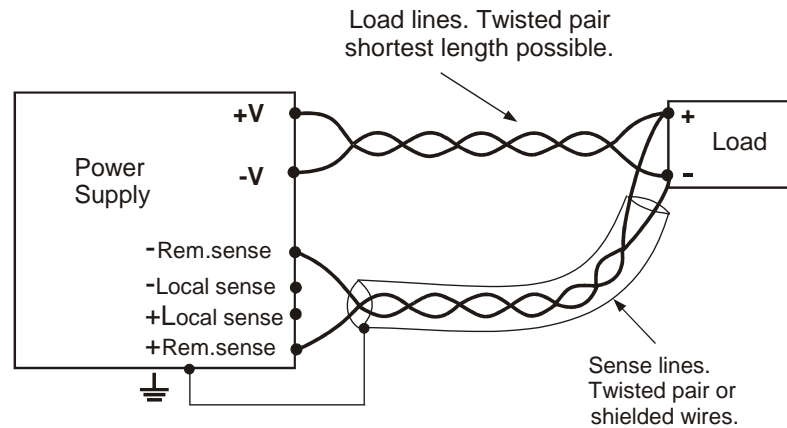
Remote sensing is especially useful in constant voltage mode with load impedances that vary or have significant lead resistance. It has no effect in constant current mode. Because sensing is independent of other power supply functions it can be used regardless of how the power supply is programmed. With remote sensing, voltage readback monitors the load voltage at the remote sense points.

Use twisted or shielded wires to minimize noise pick-up. If shielded wires are used, the shield should be connected to the ground at one point, either at the power supply chassis or the load ground. The optimal point for the shield ground should be determined by experimentation.

To configure the power supply for remote sensing:

- Turn off the power supply.
- Remove the local sense jumpers from the J2 connector.

- Connect the negative sense lead to terminal 5 (-S) and the positive sense lead to terminal 1 (+S). Make sure that the connector plug is securely inserted into the connector body.
- Turn on the power supply.



**NOTE**

If the power supply is operated with remote sensing and either the positive or negative load wire is not connected, an internal protection circuit will activate and shut down the power supply. To resume operation, turn the power supply off, connect the open load wire, and turn on the power supply.

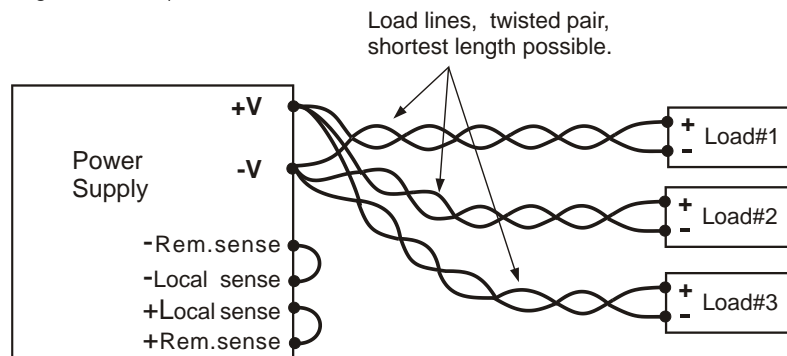
**CAUTION**

Internal components between +V and +Local sense and between -V and -Local sense can fail if the voltage drop across the load leads exceeds the allowable voltage drop on the leads (see Appendix A, Remote Sense Compensation). This can happen when using excessively long load leads.

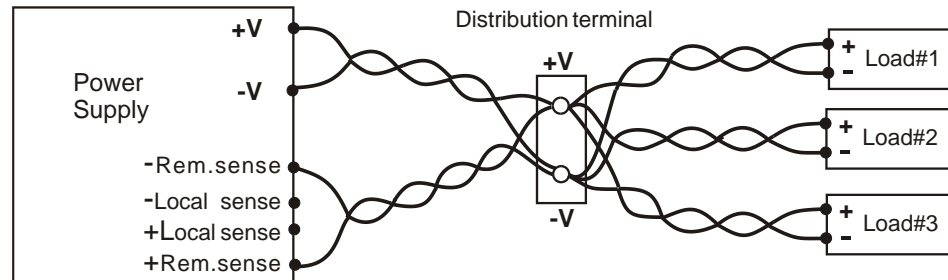
## Load Considerations

### Multiple Loads

The following figure shows multiple loads connected to one power supply. Each load should be connected to the power supply's output terminals using separate pairs of wires. It is recommended that each pair of wires will be as short as possible and twisted or shielded to minimize noise pick-up and radiation. The sense wires should be connected to the power supply output terminals or to the load with the most critical load regulation requirement.



If remotely located distribution terminals are used, as shown in the following figure, the power supply output terminals should be connected to the remote distribution terminals by a pair of twisted and/or shielded wires. Connect each load to the distribution terminals separately. Remote voltage sensing is recommended under these circumstances. Sense either at the remote distribution terminals or, if one load is more sensitive than the others, directly at the critical load.



## Output Noise and Impedance Effects

To minimize the noise pickup or radiation, the load wires and remote sense wires should be twisted-pairs to the shortest possible length. Shielding of sense leads may be necessary in high noise environments. Where shielding is used, connect the shield to the chassis via a rear panel ground screw. Even if noise is not a concern, the load and remote sense wires should be twisted-pairs to reduce coupling, which might impact the stability of power supply. The sense leads should be separated from the power leads.

Twisting the load wires reduces the parasitic inductance of the cable, which could produce high frequency voltage spikes at the load and the output because of current variation in the load itself.

The impedance introduced between the power supply output and the load could make the ripple and noise at the load worse than the noise at the power supply rear panel output. Additional filtering with bypass capacitors at the load terminals may be required to bypass the high frequency load current.

## Inductive Loads

Inductive loads can produce voltage spikes that may be harmful to the power supply. A diode should be connected across the output. The diode voltage and current rating should be greater than the power supply maximum output voltage and current rating. Connect the cathode to the positive output and the anode to the negative output of the power supply.

Where positive load transients such as back EMF from a motor may occur, connect a surge suppressor across the output to protect the power supply. The breakdown voltage rating of the suppressor must be approximately 10% higher than the maximum output voltage of the power supply.

## Battery Charging

### CAUTION

If a battery or external voltage source is connected across the output and the output is programmed below the battery or external voltage source, the power supply will continuously sink current from the external source. This could damage the power supply.

---

To avoid damaging the power supply, insert a reverse blocking diode in series with the + output connection of the power supply. Connect the diode's cathode to the + battery terminal or external voltage source. Connect the diode's anode to the + output terminal of the power supply.

## Grounding the Output

The output of the power supply is isolated from earth ground. Either positive or negative voltages can be obtained from the output by grounding (or "commoning") one of the output terminals. Always use two wires to connect the load to the output regardless of where or how the system is grounded.

To avoid noise problems caused by common-mode current flowing from the load to ground, it is recommended to ground the output terminal as close as possible to the power supply chassis ground.

### WARNING

#### SHOCK HAZARD

For models up to 60 VDC rated output, no point on the output shall be more than  $\pm 60$  VDC above or below chassis ground.

For models greater than 60 VDC rated output, no point on the Positive output shall be more than  $\pm 600$  VDC above or below chassis ground.

For models greater than 60 VDC rated output, no point on the Negative output shall be more than  $\pm 400$  VDC above or below chassis ground.

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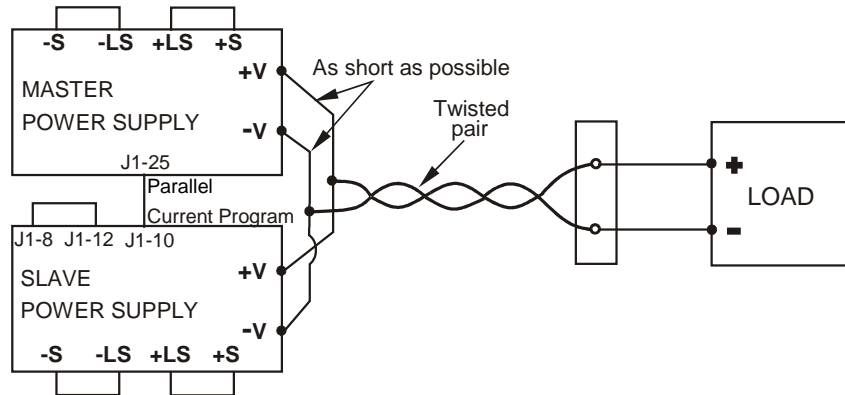
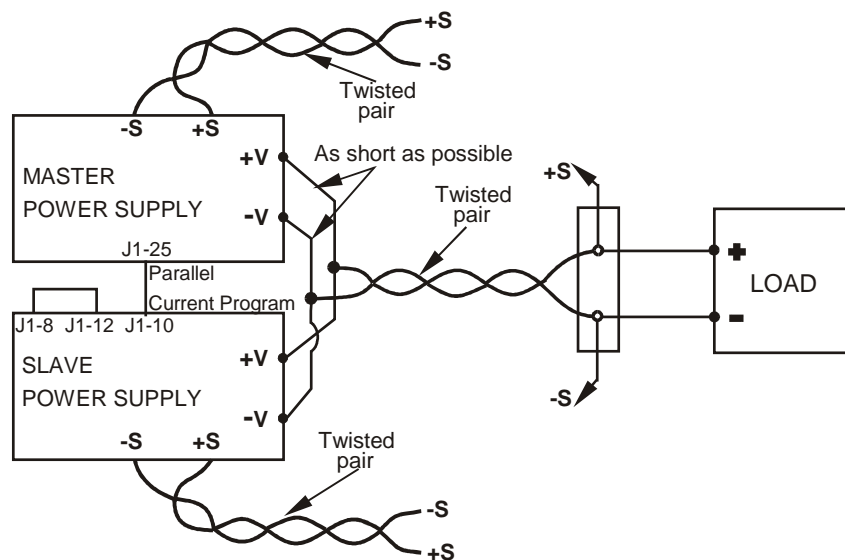
## Parallel Connections

### CAUTION

Only power supplies that have identical voltage and current ratings can be connected in parallel.

---

Up to four units of the same voltage and current rating can be connected in parallel to provide up to four times the output current capability. Refer to the following figures for typical connections of parallel power supplies using either local or remote sensing. The figures show two units, however, the same connection method applies for up to four units.

**Local Sensing****Remote Sensing**

One of the units operates as a master and the remaining units are slaves. The slave units operate as controlled current sources following the master output current. In remote operation, only the master unit can be programmed by the computer while the slave units may be connected to the computer for voltage, current and status readback only.

It is recommended that each unit supplies only up to 95% of its current rating because of the imbalance that may be caused by cabling and connections voltage drops.

## Setting up the Master Unit

Connect the sensing circuit for either local or remote sensing as shown in the previous figures. Set the master unit output voltage to the desired voltage. Program the current limit to the desired load current limit divided by the number of parallel units. During operation, the master unit operates in constant voltage mode, regulating the load voltage at the programmed output voltage.

## Setting up the Slave Units

Set the rear panel setup switch SW1 position 2 to its up position. Connect J1 pin 10 (Current Program) of the slave unit to J1 pin 25 (Parallel) of the master unit. Also connect a short between J1 pin 8 and J1 pin 12. The output voltage of the slave units should be programmed **higher** than the output voltage of the master unit to prevent interference with the master unit's control. The current limit of each unit should be programmed to the desired load current limit divided by the number of parallel units.

## Setting the Over-Voltage Protection

The master unit OVP should be programmed to the desired OVP level. The OVP of the slave units should be programmed to a **higher** value than the master. When the master unit shuts down, it programs the slave unit to zero output voltage. If a slave unit shuts down when its OVP is set lower than the master output voltage, only that unit shuts down and the remaining slave units will supply all the load current.

## Setting the Over-Current Protection

Over-current protection, if desired, may only be used with the **master** unit. When the master unit shuts down, it programs the slave units to zero output voltage.

## Series Connections

### WARNING

#### SHOCK HAZARD

For models up to 60 VDC rated output, no point on the output shall be more than  $\pm 60$  VDC above or below chassis ground.

For models greater than 60 VDC rated output, no point on the Positive output shall be more than  $\pm 600$  VDC above or below chassis ground.

For models greater than 60 VDC rated output, no point on the Negative output shall be more than  $\pm 400$  VDC above or below chassis ground.

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### CAUTION

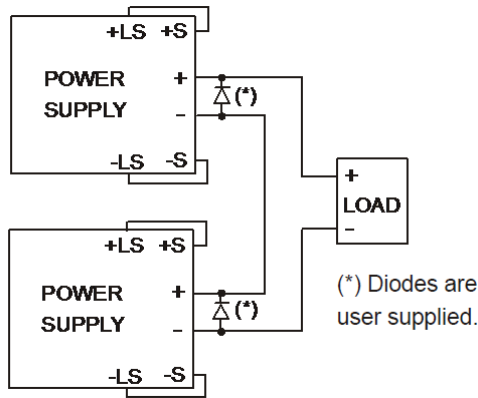
Only power supplies that have identical voltage and current ratings can be connected in series.

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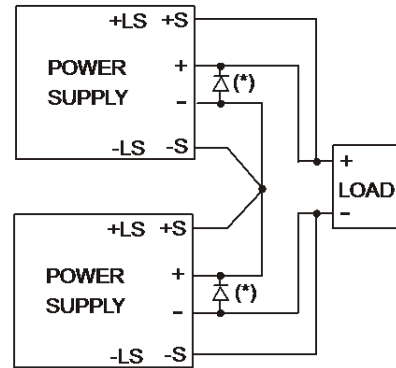
Two units of the same voltage and current rating can be connected in series to provide up to two times the output voltage capability. Because the current is the same through each element in a series circuit, outputs connected in series must have equivalent current ratings. Otherwise, the higher rated output could potentially damage the lower rated output by forcing excessive current through it under certain load conditions. Refer to the following figures for typical series connections using either local or remote sensing.



It is recommended that diodes be connected in parallel with each output to prevent reverse voltage during start up sequence or in case one unit shuts down. Each diode should be rated to at least the rated output voltage and output current of the power supply.

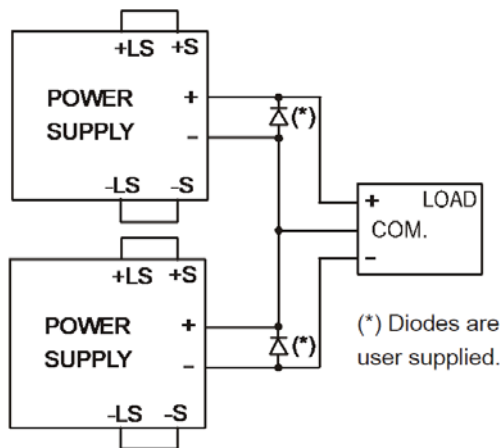


**Local Sensing**

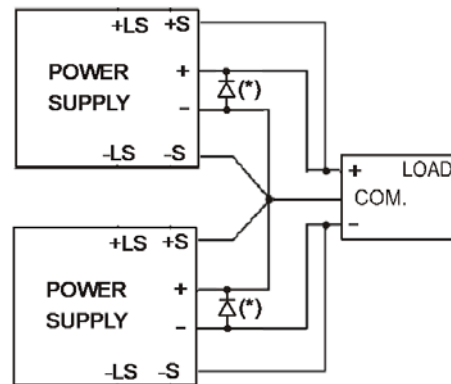


**Remote Sensing**

Refer to the following figure for typical connections of series power supplies configured as a positive and a negative output.



**Local Sensing**



**Remote Sensing**

**CAUTION**

This caution applies when using analog voltage programming with series-connected power supplies. The analog programming circuits of these power supplies are referenced to the negative sense (-S) potential. Therefore, the analog voltage circuits used to control each series-connected unit must be separated and floated from each other.

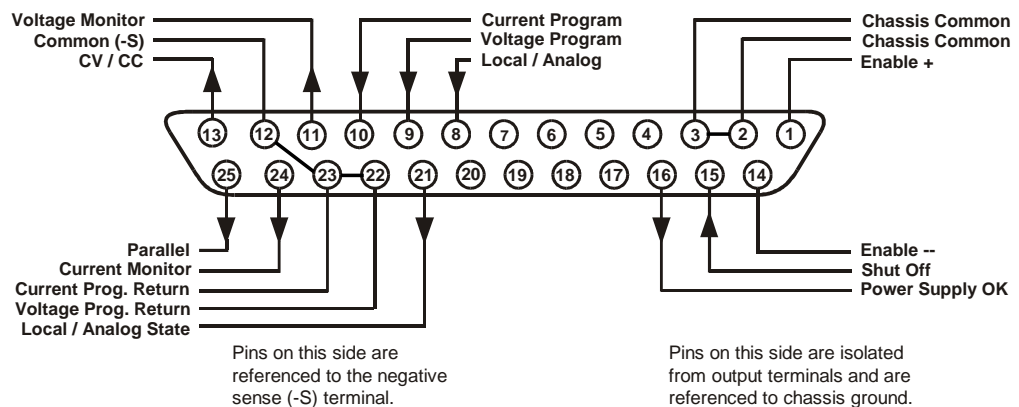
## J1 Connector Connections

### WARNING

**SHOCK HAZARD** There is a potential shock hazard at the J1 connector when using a power supply with a rated output greater than 40V. Ensure that the load wiring insulation rating is greater than or equal to the maximum output voltage of the power supply.

External programming and monitoring signal are located on the J1 connector. The power supply is shipped with a mating plug that makes it easy for you to make your wire connections. It is essential to use this plastic-body plug to conform to safety agency requirements. If a shield is required for the J1 wires, connect the shield to the ground screw located on the power supply chassis.

Refer to the following figure for the pin assignments. A description of the pins is given in chapter 1.



The mating plug specifications for the J1 connector are as follows:

<b>Mating Plug:</b>	AMP part number 745211-2
<b>Wire Size:</b>	AWG 26 to AWG 22
<b>Extraction tool:</b>	AMP part number 91232-1 or equivalent
<b>Manual pistol grip tool:</b>	Handle: AMP p/n 58074-1 Head: AMP p/n 58063-1

### CAUTION

Pins 12, 22 and 23 of J1 are connected internally to the negative sense (-S) potential of the power supply. Do not attempt to bias any of these pins relative to the negative output terminal. Use an isolated, ungrounded, programming source to prevent ground loops and to maintain the isolation of the power supply when programming from J1.

Chapter 3 describes how to configure the J1 connector when using it to program the output voltage and current.

# 3

## Operating the Power Supply Locally

Turn-On Check-Out .....	36
Normal Operation .....	38
Protection Functions .....	39
Output On/Off Controls.....	42
Analog Programming of Output Voltage and Current .....	44

This chapter contains examples on how to operate your power supply from the front panel. A check-out procedure is included to let you verify that the power supply is operating properly. Additionally, information about programming the power supply using the J1 analog programming connector is also provided.

The simple examples discussed in this chapter show you how to program:

- output voltage and current functions
- protection functions
- output on/off functions
- safe-start and auto-restart
- analog programming of voltage and current
- front panel locking

Refer to chapters 4 and 5 for information on programming your power supply using SCPI commands.

## Turn-On Check-Out

### Before Turn-On

Ensure that the power supply is configured as follows:

- The unit is connected to the proper AC mains (see chapter 2).
- The POWER switch is in the off position.
- Sense connector pins 1 and 2 are jumpered; sense connector pins 4 and 5 are jumpered.
- All switches on Connector J2 are in the down position.

#### WARNING

**SHOCK HAZARD** Be aware that hazardous voltages can be present on the output terminals. Do not set the output voltage above 40 VDC during the turn-on check-out procedure. Check to make sure that the startup mode is set to Safe-Start (see page 42).

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#### NOTE

Windows CE instruments (instruments manufactured starting in 2014) have a different turn-on characteristic than previous units. Windows CE units may take up to 30 seconds to initialize when they are turned on.

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### Constant Voltage Check

- Turn the POWER switch on.

#### CAUTION

After the “OFF” is first displayed, you need to allow a few seconds for the unit to stabilize before you enable the output with the OUT ON button. The output voltage and current settings may not be at zero during this stabilization time. Check that the settings are stable by pressing the LIMIT button and verifying that the voltage and current settings indicate zero.

---

- Turn the output on by pressing the OUT ON button. The green OUT ON indicator should be illuminated.
- The green CV indicator should also be illuminated. If the CC indicator is illuminated, rotate the current knob until the CV indicator becomes illuminated.
- Rotate the voltage knob while observing the DC VOLTS display. The output voltage should vary while the knob is turned. The voltage range is from zero to the maximum rated output for the power supply model.

### OVP Check

- Rotate the voltage knob and set the output voltage of the unit to 50% of its full-scale rating or 30 volts, whichever is lower.
- Press the OVP/UVL button once so that the DC AMPS display indicates OUP. The DC VOLTS display shows the OVP level.
- Use the voltage knob and set the OVP level of the unit to 75% of its full-scale voltage rating or 40 volts, whichever is lower.
- Wait a few seconds until the DC VOLTS display returns to show the output voltage.

- Use the voltage knob and raise the output voltage of the unit until it approaches the OVP setting. Check to make sure that the output voltage cannot be set higher than the OVP setting.
- Press the OVP/UVL button again. Rotate the voltage knob and reset the OVP level of the unit to its maximum setting.

## UVL Check

- Press the OVP/UVL button twice so that the DC AMPS display indicates UUL. The DC VOLTS display shows the UVL level.
- Use the voltage knob and set the UVL level of the unit to 50% of its full-scale voltage rating or 30 volts, whichever is lower.
- Wait a few seconds until the DC VOLTS display returns to show the output voltage.
- Use the voltage knob and lower the output voltage of the unit until it approaches the UVL setting. Check to make sure that the output voltage cannot be set lower than the UVL setting.
- Press the OVP/UVL button twice. Rotate the voltage knob and reset the UVL level of the unit to its minimum setting.

## Constant Current Check

- Turn the POWER switch off. Wait a few seconds until the AC indicator on the front panel goes out.
- Use a heavy wire and short the +V and –V output terminals together.
- Turn the POWER switch on.
- Turn the output on by pressing the OUT ON button. The green OUT ON indicator should be illuminated. The green CC indicator should be also illuminated.
- Rotate the current knob while observing the DC AMPS display. The output current should vary while the knob is turned. The current range is from zero to the maximum rated output for the power supply model.

## OCP Check

- Rotate the current knob and set the current limit of the unit to about 10% of its full-scale current rating.
- Press the OCP/488 button. This should trip the OCP protection. The OCP indicator should be illuminated, the DC VOLTS display should indicate OCP, and the Alarm indicator should be blinking.
- Press the OCP/488 button again to cancel OCP protection. The DC VOLTS display should indicate OFF because the OCP protection is latched.
- Press the OUT ON button to reset the OCP protection. The output should return to its previous setting.
- Turn the POWER switch off.
- Remove the short from the +V and –V output terminals.

## Normal Operation

The power supply has two basic operating modes: constant voltage and constant current mode. In constant voltage mode, the power supply regulates the output voltage at the selected value, while the load current varies as required by the load. In constant current mode, the power supply regulates the output current at the selected value, while the voltage varies as required by the load. The mode in which the power supply operates at any given time depends on the voltage setting, current limit setting, and the load resistance.

### Constant Voltage Mode

When the power supply is operating in constant voltage mode, the CV indicator on the front panel illuminates.

Adjustment of the output voltage can be made when the output is enabled (On) or disabled (Off). When the output is enabled, simply rotate the voltage knob to program the output voltage.

When the output is disabled, press the LIMIT button and then rotate the voltage knob. The DC VOLTS display will show the programmed voltage for 5 seconds after the adjustment has been completed and then indicate OFF.

The voltage knob can be set to coarse or fine resolution. Press the FINE button to select finer resolution. The FINE indicator turns on.

#### NOTE

If you cannot adjust the voltage to the value that you desire, the power supply may be operating at its current limit. Check the load condition and the current limit setting. Also, the voltage cannot be programmed lower than about 5% above the UVL setting, or higher than about 5% below the OVP setting.

---

### Constant Current Mode

When the power supply is operating in constant current mode, the CC indicator on the front panel illuminates.

Adjustment of the output current limit can be made when the output is enabled (On) or disabled (Off). When the output is enabled and in constant current mode, simply rotate the current knob to program the current limit. If the output is in constant voltage mode, press the LIMIT button and then rotate the current knob. The DC AMPS display will show the programmed current for 5 seconds after the adjustment has been completed and then indicate the actual output current.

When the output is disabled, press the LIMIT button and then rotate the current knob. The DC AMPS display will show the programmed current for 5 seconds after the adjustment has been completed and then go blank because the output is off.

The current knob can be set to coarse or fine resolution. Press the FINE button to select finer resolution. The FINE indicator turns on.

## CV/CC Mode Crossover

If the power supply is in constant voltage mode and the load current increases above the current limit setting, the power supply switches to constant current mode. If the load decreases below the current limit setting, the power supply switches to constant voltage mode.

## CV/CC Signal

### CAUTION

Do not connect the CV/CC signal to a voltage source higher than 30VDC. Always connect the CV/CC signal to the voltage source with a series resistor to limit the sink current to less than 10mA.

The CV/CC signal available on the J1 connector indicates the operating mode of the power supply. The CV/CC signal is an open collector output with a 30V parallel zener at J1 pin 13, referenced to common at J1 pin 12. J1 pin 12 is connected internally to the –S terminal. When the power supply operates in constant voltage mode, CV/CC output is open. When the power supply operates in constant current mode, CV/CC signal output is low (0 - 0.6V), with maximum 10mA sink current.

## Protection Functions

### Over-Voltage Protection

The over-voltage protection protects against over-voltage conditions on the output. If the output voltage attempts to exceed the programmed limit in response to an analog programming signal or in the event of a power supply failure, the over-voltage protection circuit will protect the load by disabling the output. The voltage is monitored at the sense terminals, thus providing the protection level directly at the load. Upon detection of an over-voltage condition, the output is disabled, the display shows OVP, the PROT indicator blinks, and OV is set in the Questionable Condition status register.

Adjustment of the over-voltage setting can be made when the output is enabled (On) or disabled (Off). To set the OVP level, press the OVP/UVL button so that the display indicates OUP. The display will show the OVP setting. Rotate the voltage knob to adjust the OVP level. The display will show OVP and the setting value for another five seconds and then return to its previous state.

The OVP settings are limited at the minimum level to approximately 5% above the output voltage setting. Attempting to adjust the OVP below this limit will result in no response to the adjustment attempt. Refer to Appendix A for the maximum OVP settings.

Use one of the following methods to reset the OVP circuit after it activates. If the condition that caused the over-voltage shutdown is still present, the OVP circuit will turn the output off again.

- Press the OUT ON button to turn the output on.
- Turn the AC power off, wait a few seconds, and turn it on.

- Turn the output off, then on again using the Shut Off pin on the J1 connector. This only applies in Auto-Restart mode.
- If the OVP continues to trip, try lowering the output voltage below the OVP setting, or raising the OVP setting.

## Under-Voltage Limit

Under-voltage limit is a protection function that prevents adjustment of the output voltage below a set limit either from the front panel or remote interface. It does NOT include protection trip circuitry like the over-voltage protection. The combination of UVL and OVP lets you create a protection window for sensitive load circuitry.

Setting the UVL can be made when the output is enabled (On) or disabled (Off). To set the UVL level, press the OVP/UVL button twice, so that the display shows UUL. The display will show the UVL setting. Rotate the voltage knob to adjust the UVL level. The display will show UUL and the setting value for another five seconds and then return to its previous state.

The UVL settings are limited at the maximum level to approximately 5% below the output voltage setting. Attempting to adjust the UVL above this limit will result in no response to the adjustment attempt. The minimum UVL setting is zero.

## Over-Current Protection

Over-current protection will shut down the power supply output if the load current reaches the current limit setting. This protection is useful when the load is sensitive to an over-current condition.

To arm the over-current protection, press the OCP/488 button so that the OCP indicator illuminates. When armed, a transition from constant voltage to constant current mode will activate the over-current protection. When an over-current protection event occurs, the output is disabled, the display shows OCP, the PROT indicator blinks, and OC is set in the Questionable Condition status register.

Use one of the following methods to reset over-current protection after it activates. If the load current is still higher than the current limit setting, the over-current protection will be activated again.

- Press the OUT ON button to turn the output on.
- Turn the AC power off, wait a few seconds, and turn it on.
- Turn the output off, then on again using the Shut Off pin on the J1 connector. This only applies in Auto-Restart mode.
- Press the OCP/488 button to cancel over-current protection. The display will show OFF because OCP protection is latched. Press the OUT ON button to reset OCP. With this method, the over-current protection is disabled. If the load current is still higher than the current limit setting, the power supply will only attempt to limit the current at the current limit setting.



## Over-Temperature Protection

The over-temperature protection circuit shuts down the power supply before the internal components can exceed their safe internal operating temperature. This can occur if there is a cooling fan failure. When an OTP condition occurs, the output is disabled, the display shows O7P, the PROT indicator blinks, and the OT status bit is set in the Questionable Condition status register. Resetting the OTP circuit can be automatic (non-latched) or manual (latched) depending on the Safe-Start or Auto-Restart mode.

In Safe-Start mode, the OTP circuit is latched. The display continues to show O7P and the PROT indicator continues to blink. To reset the OTP circuit, press the OUT ON button.

In Auto-Restart mode, the OTP circuit is non-latched. The power supply returns to its last setting automatically when the over-temperature condition is removed.

## Power-Fail Protection

If the AC power stops briefly, but returns before the power supply has reset, the power-fail protection circuit trips and the PF status bit is set in the Questionable Condition status register. Resetting the power-fail protection can be automatic (non-latched) or manual (latched), depending on the Safe-Start or Auto-Restart mode.

In Safe-Start mode, the output of the power supply is Off, as specified by the reset state when AC power returns. In Auto-Restart mode, the power supply recovers its last settings when AC power returns.

## Front Panel Lock-Out

The front panel controls can be locked to protect from accidental power supply parameter change. Press and hold the LIMIT button to toggle between Locked front panel and Unlocked front panel. The display will cycle between LFP and UFP. Releasing the LIMIT button while one of the modes is displayed, selects that mode.

**In Unlocked front panel mode**, the front panel controls are enabled to program and monitor the power supply parameters.

**In Locked front panel mode**, the VOLTAGE and CURRENT knobs, the OCP/488 button, and the OUT ON button are disabled

The power supply will not respond to attempts to use these controls. The display will show LFP to indicate that the front panel is locked. The OVP/UVL button remains active to preview the OVP and UVL setting. The LIMIT button also remains active to preview the output voltage and current setting or to unlock the front panel.

### NOTE

This function operates independently of the SCPI SYST:COMM:RLST command. If the front panel has been locked from the front panel, it cannot be unlocked by SYST:COMM:RLST. Conversely, if the front panel has been locked by SYST:COMM:RLST, it cannot be unlocked from the front panel.

## Output On/Off Controls

The Output On/Off controls turn the power supply output on or off. This can be done with the front panel OUT ON button or from the rear panel J1 connector. With the output off, adjustments can be made to the power supply or the load without shutting off AC power.

### OUT ON button

The OUT ON button can be pressed at any time to enable or disable the power supply output. When the output is disabled, the output voltage and current go to zero and the display shows OFF.

### Safe-Start and Auto-Restart

The power supply can be programmed to have either the last operating settings (Auto-Restart) or the reset settings (Safe-Start) apply at turn-on. Press and hold the OUT ON button to select between Safe-Start and Auto-Restart modes. The display continuously cycles between SAF and AUT every three seconds. Releasing the OUT ON button while one of the modes is displayed, selects that mode.

**In Safe-Start mode**, the power supply turns on with the reset settings (see chapter 5 under “\*RST”). The output is disabled and the output voltage and current are zero. This is the factory default.

#### CAUTION

After the “OFF” is first displayed, you need to allow a few seconds for the unit to stabilize before you enable the output with the OUT ON button. The output voltage and current settings may not be at zero during this stabilization time. Check that the settings are stable by pressing the LIMIT button and verifying that the voltage and current settings indicate zero.

**In Auto-Restart mode**, the power supply restores the operating settings that were saved when it was last turned off (see below). The output is either enabled or disabled according to its last setting.

Output On/Off state	UVL level
Output voltage setting	OCP setting
Output current setting	Locked/Unlocked front panel
OVP level	Start-up mode

### Output Shut-Off Terminals

Output Shut-Off (SO) terminals are available on the J1 connector to enable or disable the power supply output. **This function is edge-triggered.** J1 pin 15 is the Shut-Off input, and pins 2 and 3, which are connected internally, are the signal common. All pins are optically isolated from the power supply output. The Shut-Off input accepts a 2.5V-to-15V signal or an open/short contact to enable or disable the output. The Shut-Off control logic is selected by SW1 setup switch 5.

When an on-to-off transition is detected at the Shut-Off input, the Shut-Off

function enables or disables the output according to the signal level or the open/short applied to J1 pin 15. When the output has been disabled by the Shut-Off function, the display shows SO to indicate the output is disabled.

To re-enable the output after it has shut down, you must disable the Shut-Off signal. In Auto-Restart mode, operation resumes automatically. In Safe-Start mode the Shut-Off function is latched. You must also press the OUT ON button or send an OUTPut:PROTEction:CLEar command to resume operation.

The Shut-Off function can be used to shut down multiple power supplies in a daisy-chain fashion as explained later in this chapter. It can also be used to reset the OVP and OCP as previously described.

SW1 switch 5	SO Signal Level	Output	Display
Down (default)	2 - 15 V or Open	On	Voltage/Current
	0 - 0.4V or Short	Off	SO
Up	2 - 15 V or Open	Off	SO
	0 - 0.4V or Short	On	Voltage/Current

**NOTE**

Because this function is edge-triggered, it may not be triggered by every state change. For example, after applying AC power, the output will not be disabled by the Shut Off function if the Shut-Off input is in the shut-off state. This is because the unit has not detected an on-to-off signal transition.

### Enable/Disable Terminals

**CAUTION**

To prevent possible damage to the unit, do not connect the Enable + or Enable - terminals to the positive or negative output terminals.

Enable/Disable terminals are available on the J1 connector to enable or disable the power supply output. **This function is level-triggered.** Simply connect a switch or relay between J1 pins 1 and 14. This function is activated by SW1 setup switch 9.

These pins disable the output when they are opened. When the output is disabled, the PROT indicator on the front panel will blink.

To re-enable the output after it has shut down, you must short the Enable + and Enable - terminals. In Auto-Restart mode, operation resumes automatically. In Safe-Start mode the Enable/Disable function is latched. You must also press the OUT ON button or send an OUTPut:PROTEction:CLEar command to resume operation.

SW1 switch 9	ENA+/ENA- pins	Output	Display	Prot Indicator
Down (default)	Not active	On	Voltage/Current	Off
Up	Opened	Off	ENA	Blinking
	Shorted	On	Voltage/Current	Off

## Power Supply OK Signal

The Power Supply OK signal on the J1 connector indicates a fault condition in the power supply. J1 pin 16 is a TTL output signal. Pins 2 and 3, which are connected internally, are the signal common. All pins are optically isolated from the power supply output. With no fault, Power Supply OK is high, with a maximum source current of 2mA. When a fault occurs, Power Supply OK is low, with a maximum sink current of 1mA. The following faults set this signal low:

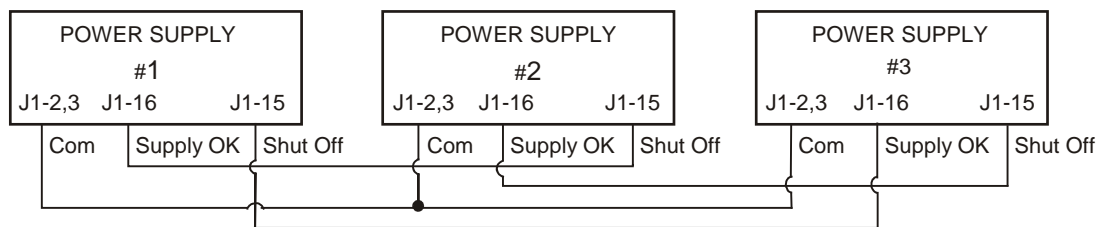
Over-voltage protection	Enable/Disable signal true
Over-current protection	Shut Off signal true
Over-temperature protection	Remote interface failure
AC line failure	Output turned off

## Daisy-Chained Output Shut-down

It is possible to configure a multiple power supply system to shut down all the units when a fault condition occurs in one of the units. SW1 setup switch 5 must be in the Down position to enable the daisy-chain operation. Other switches are unaffected by this setting.

If a fault occurs in one unit, its Power Supply OK signal is set low and its display will indicate the fault. The other units shut off with their displays indicating SO. When the fault condition is cleared, all units will recover according to their Safe-Start or Auto-Restart settings.

The following figure shows three units daisy-chained - the same connection method can be used with additional units. The Shut Off and Power Supply OK signals are referenced to Chassis Common (J1 pins 2 and 3).



## Analog Programming of Output Voltage and Current

### CAUTION

J1 pin 12, pin 22, and pin 23 are internally connected to the negative sense terminal. Do not reference these pins to any terminal other than the negative sense terminal, as it may damage the unit.

In Local mode, the output voltage and current is programmed with the front panel VOLTAGE and CURRENT knobs or over the remote interface. In Analog mode, the output voltage and current can be programmed either by an analog voltage or by resistors connected to the rear panel J1 connector.

The J1 connector also provides monitoring signals for the output voltage and output current. The programming range and monitoring signal range can be selected using the SW1 setup switch.

**NOTE**

With analog programming enabled, you cannot program the output voltage or current using the front panel knobs or the remote interface. However, you can read back output voltage or current from the front panel or the remote interface.

### Analog Programming Control Terminals

J1 connector pin 8 accepts a TTL signal or an open/short contact switch (referenced to pin 12) to select between Local or Analog programming of the output voltage and current. This function is enabled or disabled by SW1 setup switches 1 and 2.

J1 connector pin 21 is an open collector output that indicates if the power supply is in Local mode or in Analog mode. To use this output, connect a pull-up resistor to a voltage source of 30 VDC maximum. Choose the pull-up resistor so that the sink current will be less than 5mA when the output is in low state.

SW1 switch 1 and 2	J1 pin 8 function	J1 pin 21 signal	Output voltage/current control
Both Down (default)	No effect	Open	Local
Either one, or both Up	0 or Short	0~0.6V	Analog
	1 or Open	Open	Local

### Voltage Programming of Output Voltage and Current

**CAUTION**

To maintain the isolation of the power supply and prevent ground loops, use an isolated programming source when operating the unit using analog programming.

Voltage programming sources of 0 - 5 V or 0 - 10 V can be used to program the output voltage and current limit from zero to full scale.

Set the power supply to analog voltage programming as follows:

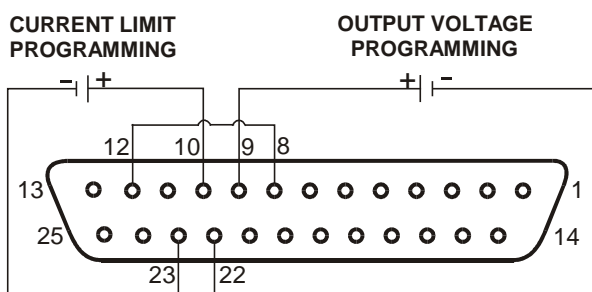
- Make sure that the power supply is turned off.
- Set SW1 setup switch 1 (for voltage) and 2 (for current) to the Up position.
- Set SW1 setup switch 3 to select programming voltage range according to the following table.
- Make sure that SW1 setup switches 7 and 8 are set Down.
- Connect a short between J1 pin 8 and J1 pin 12 (see figure).
- Connect the programming source to the mating plug of J1 as shown in the following figure. Observe the correct polarity for the voltage source.

### 3 Operating the Power Supply Locally

- Set the programming sources to the desired levels and turn the power supply on. Adjust the programming sources to change the power supply output.

The analog control circuits let you set the output voltage and current limit up to 5% over the model-rated maximum value. The power supply will operate within the extended range, however it is not recommended to operate the power supply over its voltage and current rating, and performance in this region is not guaranteed.

SW1 switch 3	Voltage Programming (J1 pin 9)	Current Programming (J1 pin 10)
Down (default)	0 – 5 V	0 – 5 V
Up	0 – 10 V	0 – 10 V



### Resistance Programming of Output Voltage and Current

Resistances of 0 – 5 k $\Omega$  or 0 – 10 k $\Omega$  can be selected to program the output voltage and current limit from zero to full scale. Internal current sources supply a 1mA current through the external resistors. The voltage drop across the resistors is used as the programming voltage for the power supply. To maintain the temperature stability specification of the power supply, only use resistors that are stable and low noise, with a temperature coefficient less than 50ppm.

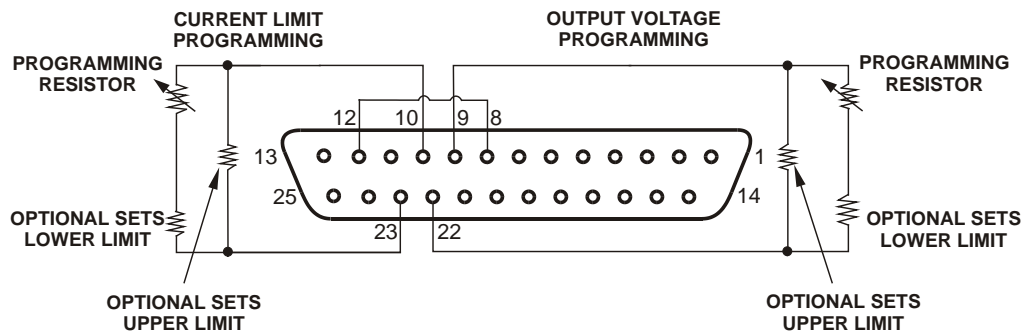
Set the power supply to resistance programming as follows:

- Make sure that the power supply is turned off.
- Set SW1 setup switch 1 (for voltage) and 2 (for current) to the UP position.
- Set SW1 setup switch 3 to select programming resistance range according to the following table.
- Set SW1 setup switch 7 (for voltage) and 8 (for current) to the Up position to enable resistance programming.
- Connect a short between J1 pin 8 and J1 pin 12 (see figure).
- Connect the programming resistors to the mating plug of J1 as shown in the following figure. A variable resistor can control the output over its entire range, or a combination of variable resistor and series/parallel resistors can control the output over a restricted portion of its range.

- Set the programming resistors to the desired resistance and turn the power supply on. Adjust the resistors to change the power supply output.

The analog control circuits let you set the output voltage and current limit up to 5% over the model-rated maximum value. The power supply will operate within the extended range, however it is not recommended to operate the power supply over its voltage and current rating, and performance in this region is not guaranteed.

SW1 switch 3	Voltage Programming (J1 pin 9)	Current programming (J1 pin 10)
Down (default)	0 – 5 kΩ	0 – 5 kΩ
Up	0 – 10 kΩ	0 – 10 kΩ



### External Monitoring of Output Voltage and Current

The J1 connector also provides analog signals for monitoring the output voltage and current. Selection of the voltage range between 0 – 5 V or 0 – 10 V is made by SW1 setup switch 4. The monitoring signals represent 0 to 100% of the power supply output voltage and current rating. The monitor outputs have a 500 Ω series output resistance. Make sure that the sensing circuit has an input resistance greater than 500 kΩ or the accuracy will be reduced.

SW1 switch 4	Voltage range	J1 signal connection	Signal function
Down (default)	0 – 5 V	J1 pin 11	Voltage Monitor
		J1 pin 24	Current Monitor
Up	0 – 10 V	J1 pin 11	Voltage Monitor
		J1 pin 24	Current Monitor

J1 pin 12 is the signal common for J1 pins 11 and 24.





# 4

## Operating the Power Supply Remotely

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This chapter contains information on how to configure the three remote interfaces that are provided on the back of the instrument. In most cases you can connect your power supply to any one of these interfaces and be up and running with a minimum amount of configuration.

### NOTE

Detailed information on configuring the remote interfaces is included in the *USB/LAN/GPIB Interfaces Connectivity Guide* document located on the Automation-Ready CD-ROM included with this product.

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This chapter also contains a brief introduction to the SCPI Programming language. SCPI (Standard Commands for Programmable Instruments) is a programming language for controlling instrument functions over the GPIB. SCPI is layered on top of the hardware-portion of IEEE 488.2. The same SCPI commands and parameters control the same functions in different classes of instruments.

## Connecting to the Interfaces

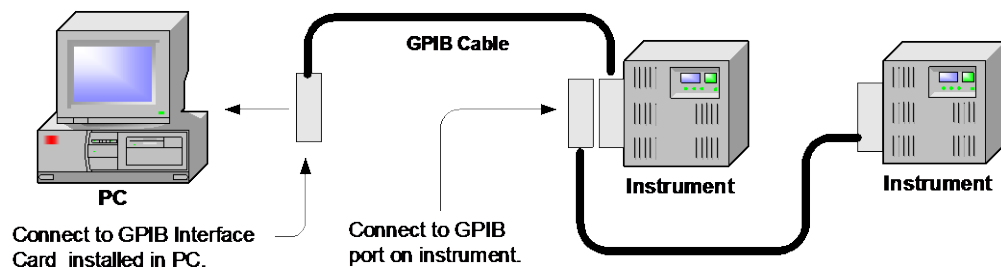
The Keysight N5700 power supplies support remote interface communication using a choice of three interfaces: GPIB, USB, and LAN. All three interfaces are live at power-on.

### GPIB Interface

#### NOTE

For detailed information about GPIB interface connections, refer to the Keysight Technologies *USB/LAN/GPIB Interfaces Connectivity Guide*, located on the Automation-Ready CD-ROM that is shipped with your product.

The following steps will help you quickly get started connecting your instrument to the General Purpose Interface Bus (GPIB). The following figure illustrates a typical GPIB interface system.



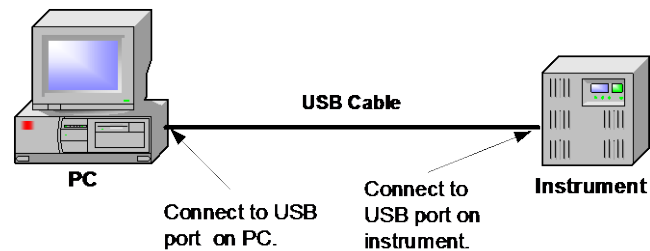
- 1 If you have not already done so, install the Keysight IO Libraries Suite from the Automation-Ready CD-ROM that is shipped with your product.
- 2 If you do not have a GPIB interface card installed on your computer, turn off your computer and install the GPIB card.
- 3 Connect your instrument to the GPIB interface card using a GPIB interface cable.
- 4 Use the Connection Expert utility of the Keysight IO Libraries Suite to configure the installed GPIB interface card's parameters.
- 5 The power supply is shipped with its GPIB address set to 5. Use the front panel menu if you need to change the GPIB address.
  - a Press and hold the OCP/488 button for about three seconds. The DC VOLTS display will show the present GPIB address.
  - b To change the GPIB address, turn the voltage knob until the desired GPIB address appears in the display. Valid GPIB addresses are in the range of 0 to 30.
- 6 You can now use Interactive IO within the Connection Expert to communicate with your instrument, or you can program your instrument using the various programming environments.

## USB Interface

### NOTE

For detailed information about USB interface connections, refer to the Keysight Technologies *USB/LAN/GPIB Interfaces Connectivity Guide*, located on the Automation-Ready CD-ROM that is shipped with your product.

The following steps will help you quickly get started connecting your USB-enabled instrument to the Universal Serial Bus (USB). The following figure illustrates a typical USB interface system.



- 1 If you have not already done so, install the Keysight IO Libraries Suite from the Automation-Ready CD-ROM that is shipped with your product.
- 2 Connect your instrument to the USB port on your computer.
- 3 With the Connection Expert utility of the Keysight IO Libraries Suite running, the computer will automatically recognize the instrument. This may take several seconds. When the instrument is recognized, your computer will display the VISA alias, IDN string, and VISA address. This information is located in the USB folder.

### NOTE

The VISA address is: `USB0::2391::2055::serialnumber::0:INSTR` where 2391 is the Keysight code, 2055 is the N5700 code, and serial number is the 10-character serial number located on the label on the side of the unit.

- 4 You can now use Interactive IO within the Connection Expert to communicate with your instrument, or you can program your instrument using the various programming environments.

## LAN Interface

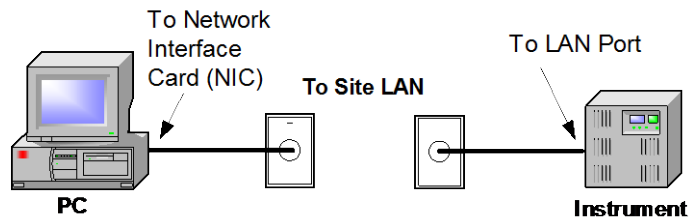
### NOTE

For detailed information about LAN interface connections, refer to the Keysight Technologies *USB/LAN/GPIB Interfaces Connectivity Guide*, located on the Automation-Ready CD-ROM that is shipped with your product.

The following steps will help you quickly get started connecting and configuring your instrument on a local area network (LAN). The two types of local area networks connections that are discussed in this section are site networks and private networks.

## Connecting to a Site LAN

A site LAN is a local area network in which LAN-enabled instruments and computers are connected to the network through routers, hubs, and/or



switches. They are typically large, centrally-managed networks with services such as DHCP and DNS servers.

- 1 If you have not already done so, install the Keysight IO Libraries Suite from the Automation-Ready CD-ROM that is shipped with your product.
- 2 Connect the instrument to the site LAN. Provided that your network has a DHCP server and uses Dynamic DNS naming service, the instrument will automatically obtain an IP address from the network. This may take up to one minute. It will also register its hostname with the dynamic DNS server. The default hostname can then be used to communicate with the instrument.

The front panel **LAN** indicator will come on when the LAN port has been configured. If you are unable to communicate with the instrument, check that a valid IP address has been assigned. Press the front panel LAN button to view the IP address.

### NOTE

Each Keysight N5700 power supply is shipped with a default hostname with the format: A-modelnumber-serialnumber where *modelnumber* is the instrument's 6-character model number (e.g. N5741A), and *serialnumber* is 5th through the 9th character of the 10-character serial number located on the label on the side of the unit (e.g. H1234 if the serial number is US24H12345). A-N5741A-H1234 is an example of a hostname.

- 3 Use the Connection Expert utility of the Keysight IO Libraries Suite to add the N5700 power supply and verify a connection. To add the instrument, you can request the Connection Expert to discover the instrument. If the instrument cannot be found, you can add the instrument using the instrument's hostname.

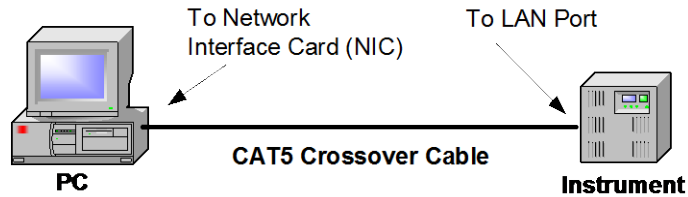
### NOTE

If this does not work, refer to the chapter on "Troubleshooting Guidelines" in the Keysight Technologies *USB/LAN/GPIB Interfaces Connectivity Guide*.

- 4 You can now use Interactive IO within the Connection Expert to communicate with your instrument, or you can program your instrument using the various programming environments. You can also use the Web browser on your computer to communicate with the instrument as described under "Using the Web Server" later in this chapter.

### Connecting to a Private LAN:

A private LAN is a network in which LAN-enabled instruments and computers are directly connected, and not connected to a site LAN. They are typically small, with no centrally-managed resources.



- 1 If you have not already done so, install the Keysight IO Libraries Suite from the Automation-Ready CD-ROM that is shipped with your product.
- 2 Connect the instrument to the computer using a LAN crossover cable. Alternatively, connect the computer and the instrument to a standalone hub or switch using regular LAN cables.

#### NOTE

Make sure your computer is configured to obtain its address from DHCP and that NetBIOS over TCP/IP is enabled. If the computer had been connected to a site LAN, it may still retain previous network settings from the site LAN. Wait one minute after disconnecting it from the site LAN before connecting it to the private LAN. This allows Windows to sense that it is on a different network and restart the network configuration. If you are running Windows 98, you may need to manually release the previous settings.

- 3 The factory-shipped instrument LAN settings are configured to automatically obtain an IP address from the network using a DHCP server, or using AutoIP if a DHCP server is not present. You can leave these settings as they are. Most Keysight products and most computers will automatically choose an IP address using auto-IP if a DHCP server is not present. Each assigns itself an IP address from the block 169.254.nnn. Note that this may take up to one minute.

The front panel **LAN** indicator will come on when the LAN port has been configured. If you are unable to communicate with the instrument, check that a valid IP address has been assigned. Press the front panel LAN button to view the IP address.

- 4 Use the Connection Expert utility of the Keysight IO Libraries Suite to add the N5700 power supply and verify a connection. To add the instrument, you can request the Connection Expert to discover the instrument. If the instrument cannot be found, you can add the instrument using the instrument's hostname. The default hostname is described under "Connecting to a Site LAN".

#### NOTE

If this does not work, refer to the chapter on "Troubleshooting Guidelines" in the Keysight Technologies *USB/LAN/GPIB Interfaces Connectivity Guide*.

- 5 You can now use Interactive IO within the Connection Expert to communicate with your instrument, or you can program your instrument using the various programming environments. You can also use the Web browser on your computer to communicate with the instrument as described under “Using the Web Server”.

## LAN Communication

The Keysight IO Libraries Suite along with instrument drivers for specific programming environments can be used to communicate with your power supply. You can also communicate with your power supply using its built-in Web server, the Telnet utility, or sockets. These latter methods are a convenient way to communicate with the power supply without using I/O libraries or drivers.

### Ethernet Connection Monitoring

Keysight N5700 power supplies that have the LXI label on the front panel provide Ethernet connection monitoring. With Ethernet connection monitoring, the instrument’s LAN port is continually monitored, and automatically reconfigured when the instrument is unplugged for a minimum of 20 seconds and then reconnected to a network. The front panel **LAN** indicator will come on when the LAN port is connected and configured.

### Using the Web Server

Your power supply has a built-in Web server that lets you control it directly from an internet browser on your computer. With the Web server, you can control and configure all of the front panel functions as well as additional functions such as triggering and the LAN parameters, which are not available from the front panel.

#### NOTE

The built-in Web server only operates over the LAN interface. It requires Internet Explorer 7+. You also need the Java Plug-in version 7+. This is included in the Java Runtime Environment.

---

The Web server is enabled when shipped. To launch the Web server:

- 1 Open the internet browser on your computer.
- 2 In the Tools menu, under Internet Options, select Connections, then LAN Settings, and make sure that the Bypass proxy server for local addresses box is checked.
- 3 Enter the instrument’s hostname into the browser’s Address field to launch the Web server. The following home page will appear.
- 4 Click on the Browser Web Control button in the navigation bar on the left to begin controlling your instrument.
- 5 For additional help about any of the pages, click on the Help with this Page button.

If desired, you can control access to the Web server using password protection. As shipped from the factory, no password is set. To set a password, refer to the section “Configuring the LAN Parameters”.

The screenshot shows the web interface for a Keysight N5700/N8700 System DC Power Supply. The page title is 'Web-Enabled N5748A'. A navigation bar on the left includes links for 'Welcome Page', 'Browser Web Control', 'View & Modify Configuration', and 'Help with this Page'. The main content area features a table with the following information:

Instrument:	N5748A
Serial Number:	US20N7253J
Description:	Keysight N5748A Power Supply - US20N7253J
DNS Hostname:	A-N5748A-7253J
NetBIOS Name:	A-N5748A-7253J
mDNS Hostname:	A-N5748A-7253J.local
IP Address:	141.121.202.167
Instrument Address String:	TCPIP:A-N5748A-7253J:inst0:INSTR

Below the table, there is a checkbox for 'Turn On Front Panel Identification Indicator' and a link for 'Advanced information about this Web-Enabled System DC Power Supply'. A footer note states: 'Use the navigation bar on the left to access your N5748A and related information. © Keysight Technologies, Inc. 2014'.

## Using Telnet

In an MS-DOS Command Prompt box type: `telnet hostname 5024` where *hostname* is the N5700 hostname or IP address, and 5024 is the instrument's telnet port.

You should get a Telnet session box with a title indicating that you are connected to the power supply. Type the SCPI commands at the prompt.

## Using Sockets

Keysight instruments have standardized on using port 5025 for SCPI socket services. A **data socket** on this port can be used to send and receive ASCII/SCPI commands, queries, and query responses. All commands must be terminated with a newline for the message to be parsed. All query responses will also be terminated with a newline. The power supply allows any combination of up to three simultaneous data socket and telnet connections to be made.

The socket programming interface also allows a **control socket** connection. The control socket can be used by a client to send device clear and to receive service requests. Unlike the data socket, which uses a fixed port number, the port number for a control socket varies and must be obtained by sending the following SCPI query to the data socket: `SYSTEM:COMMunicate:TCPIp:CONTROL?`

After the control port number is obtained, a control socket connection can be opened. As with the data socket, all commands to the control socket must be terminated with a newline. All query responses will also be terminated with a newline.

To send a device clear, send the string "DCL" to the control socket. When the power supply has finished performing the device clear it echoes the string "DCL" back to the control socket.

Service requests are enabled for control sockets using the Service Request Enable register. Once service requests have been enabled, the client program listens on the control connection. When SRQ goes true

the instrument will send the string “SRQ +nn” to the client. The “nn” is the status byte value, which the client can use to determine the source of the service request.

## Configuring the LAN Parameters

To configure the LAN parameters from the instrument’s Web server, launch the Web server as previously described, and click on the View & Modify Configuration tab on the left side of the page. Then click on the Modify Configuration button on the top of the page. The following screen lets you modify the LAN parameters:

Parameter	Value
IP Address Configuration:	<input checked="" type="radio"/> Automatic <input type="radio"/> Manual
IP Address:	<input type="text"/>
Subnet Mask:	<input type="text"/>
Default Gateway:	<input type="text"/>
DNS Server Address Configuration:	<input checked="" type="radio"/> Automatic <input type="radio"/> Manual
Preferred DNS Server:	<input type="text"/>
Alternate DNS Server:	<input type="text"/>
Desired Hostname:	A-N5748A-7253J (Requires reboot to take effect)
Description: <small>Used as the desired mDNS service name</small>	Keysight N5748A DC Power Supply - US20N7253J
mDns Enabled:	<input checked="" type="checkbox"/> Enabled
Password:	<input type="checkbox"/> Set a Password <input type="text"/> (Enter New password) <input type="text"/> (Confirm New password)

The configurable LAN parameters are described as follows:

**IP Address Configuration** This setting indicates how the instrument will determine its IP Address, Subnet Mask, and Default Gateway.

If Automatic is selected, the instrument tries to obtain an IP address from a DHCP server. If a DHCP server is found, the DHCP server assigns an IP address, Subnet Mask and Default Gateway to the instrument. If no DHCP server is found, the instrument automatically configures its IP address and Subnet Mask using Dynamically Configured Link Local Addressing (Auto-IP), which results in an address in the range 169.254.xxx.yyy.

If Manual is selected, the instrument uses the IP Address, Subnet Mask, and Default Gateway defined below..

**IP Address** This value is the instrument’s Internet Protocol (IP) address. An IP Address is four decimal numbers from 0 to 255 separated by periods. It is required for all IP and TCP/IP communications with the instrument.

Note that the Internet Engineering Task Force reserved the IP address range of 169.254.1.0 to 169.254.254.255 for link-local addressing (auto-IP). Do not assign a manual (static) IP address within this range.



<b>Subnet Mask</b>	This value enables the instrument to determine whether a client IP address is on the same local subnet. When a client IP address is on a different subnet, all packets must be sent to the Default Gateway. A value of 0.0.0.0 or 255.255.255.255 disables subnetting.
<b>Default Gateway</b>	This value is the IP Address of the default gateway that allows the instrument to communicate with systems that are not on the local subnet. This is the default subnet gateway, where packets are sent that are destined for a device not on the local subnet, as determined by the subnet mask setting. A value of 0.0.0.0 disables subnetting.
<b>DNS Server Address Configuration</b>	This setting indicates how the instrument will determine its DNS server, either manually or automatically from a DHCP server.  If Automatic is selected, the instrument tries to obtain a DNS server address from a DHCP server.  If Manual is selected, the instrument uses the DNS servers defined below.
<b>Preferred DNS Server</b>	This is the address of the Domain Name System (DNS) server. DNS is an internet service that translates domain names into IP addresses. The instrument uses this server to determine and display its hostname.
<b>Alternate DNS Server</b>	This is the address of the alternate Domain Name System (DNS) server.
<b>Desired Hostname</b>	If Dynamic DNS is available on your network and your instrument uses DHCP, the Hostname is registered with the Dynamic DNS service at power-on. If the field is blank, the factory default hostname is restored. A hostname must start with a letter and may contain upper and lower case letters, numbers and dashes(-). The Maximum length is 15 characters. The default format is A-<modelnumber>-<digits 5 through 9 of serialnumber>.
<b>Description</b>	This field contains the desired mDNS service name for the instrument, which makes it easy to identify the device on the network. This description is also shown on the instrument's Welcome page. If the field is blank, the factory default description is restored. Maximum length is 39 characters.
<b>mDNS Enabled</b>	This enables or disables mDNS service announcements. mDNS is affected by the Desired Hostname and Description fields.
<b>Password</b>	If a password has been set, you will be prompted for it before going to the Modify Configuration and Browser Web Control pages. The password may contain letters, numbers, or underscores (_). Once set, the password may be disabled by entering the old password, and leaving the new password fields empty. The password is also cleared by a LAN Reset from the instrument's front panel. Maximum length is 12 characters.

**NOTE**

The configuration parameters on pre-Windows CE instruments (instruments manufactured before mid-2014) are slightly different than those described above. For a description of these previous parameters, access the Modify Configuration dialog; then click on the Help with this Page button.

### Factory-shipped LAN Settings

The factory-shipped LAN settings documented in the following table are optimized for connecting your power supply to a site network. They should also work well for other network configurations.

The factory-shipped settings can be restored by pressing and holding the front panel LAN button for three seconds. Pressing the LAN button again while the message “LAN rES” is displayed resets the LAN settings.

Factory-shipped non-volatile LAN settings			
Get IP Address	Automatic	Alternate DNS server	Blank
IP Address	169.254.57.0	Desired Hostname	A-N57xxA-xxxxx
Subnet Mask	255.255.0.0	Description	Keysight N57xxA (serial#)
Default Gateway	0.0.0.0	mDNS Enabled	Enabled
DNS Server Address Configuration	Automatic	Password	Blank
Preferred DNS server	Blank		

## SCPI Commands – an Introduction

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based instrument command language designed for test and measurement instruments. SCPI commands are based on a hierarchical structure, also known as a tree system. In this system, associated commands are grouped together under a common node or root, thus forming subsystems. Subsystem commands perform specific power supply functions. A portion of the SOURce subsystem is shown below to illustrate the tree system.

```
[SOURce:]
  CURRent
    [:LEVel]
      [:IMMEDIATE] <NRf+>
      :TRIGgered <NRf+>
    :PROTection
      :STATe <Bool>
```

SOURce is the root keyword of the command, CURRent is a second-level keyword, LEVel and PROTection are third-level keywords, and IMMEDIATE, TRIGgered and STATe are fourth-level keywords. Colons (:) separate higher-level from lower-level keywords.

### Syntax

The following command syntax is used in this manual:

- Square Brackets [ ]** Items within square brackets are optional. The representation [SOURce:]VOLTage means that SOURce: may be omitted.
- Angle brackets < >** Items within angle brackets are parameter descriptions. For example, <NR1> indicates a specific form of numerical data.
- Vertical bar |** Vertical bars separate alternative parameters. For example, VOLT | CURR indicates that either "VOLT" or "CURR" can be used as a parameter.

The syntax characters cannot be included in the command string.

### Multiple Commands in a Message

Multiple SCPI commands can be combined and sent as a single message with one message terminator. There are two important considerations when sending several commands within a single message:

- Use a semicolon (;) to separate commands within a message.
- There is an implied path that affects how commands are interpreted by the power supply.

The command path can be thought of as a string that gets inserted **before** each keyword within a message. For the first command in a message, the path is a null string. For each subsequent command the path is defined as the characters that make up the keywords of the previous command in the message up to and including the last colon separator. An example of a message with two commands is:

```
OUTPut:STATE ON;PROTection:CLEAr
```

which shows the use of the semicolon separating the two commands, and also illustrates the command path concept. Note that with the second command, the leading keyword `OUTPut` was omitted because after the `OUTPut:STATE ON` command, the path became defined as `OUTPut`, and thus the second command was interpreted as:

```
OUTPut:PROTection:CLEAr
```

In fact, it would have been incorrect to include the `OUTPut` keyword in the second command, because the result after combining it with the command path would be:

```
OUTPut:OUTPut:PROTection:CLEAr
```

which would result in a syntax error.

### Commands from Different Subsystems

In order to combine commands from different subsystems, you need to be able to reset the command path to a null string within a message. Beginning the command with a colon (:), discards the previous path. For example, you could clear the output protection and check the status of the Operation Condition register in one message by using a root specifier as follows:

```
OUTPut:PROTection:CLEAr;:STATus:OPERation:CONDition?
```

The following message shows how to combine commands from different subsystems as well as within the same subsystem.

```
VOLTage:LEVEl 7.5;PROTection 10;:CURRent:LEVEl 0.25
```

Note the use of the optional keyword `LEVEl` to maintain the correct path within the subsystems, and the use of the root specifier (`:`) to move between subsystems.

### Message Unit

The simplest SCPI command is a single message unit consisting of a keyword followed by a message terminator such as newline. The message unit may include a parameter after the keyword. The parameter can be numeric or a string.

```
ABORt<NL>
```

```
VOLTage 20<NL>
```

```
VOLTage:TRIGgered MINimum<NL>
```

Colons (`:`) separate higher-level keywords from lower-level keywords. Use a blank space to separate parameters from keywords. If a command requires more than one parameter, use commas to separate adjacent parameters.

In the previous examples, the upper-case letters indicate the abbreviated spelling for the keyword. For shorter program lines, you can send the abbreviated form. For better program readability, you can send

the long form. For example, VOLT and VOLTage are both acceptable forms. You can use upper- or lower-case letters. Therefore, VOLTAGE, Volt, and volt are all acceptable. Other forms, such as VOL and VOLTAG, generate an error.

## Queries

You can query the current value of most commands by adding a question mark to the command (VOLTage?, VOLTage:TRIGgered?). If a query contains a parameter, place the query indicator at the end of the last keyword. Observe the following precautions with queries:

- Add a blank space between the query indicator (?) and any subsequent parameter. (VOLTage:TRIGgered? MAX)
- Set up the proper number of variables for the returned data.
- Read back all the results of a query before sending another command to the power supply. Otherwise a *Query Interrupted* error will occur and the unreturned data will be lost.

## Common Commands

Common commands generally control overall power supply functions, such as reset, status, and synchronization. All common commands consist of a three-letter mnemonic preceded by an asterisk: \*RST \*IDN? \*SRE 8

You can combine common commands with subsystem commands in the same message. Use semicolons to separate the common command from the subsystem commands. Common commands *do not affect the command path*; you may insert them anywhere in the message.

```
VOLTage:TRIGgered 10;:INITiate;*TRG
```

```
OUTPut OFF;*RCL 2;OUTPut ON
```

## Command Terminators

A terminator informs SCPI that it has reached the end of a command. Three permitted command terminators are:

- newline (<NL>), which is ASCII decimal 10 or hex 0A.
- end or identify (<END>)
- both of the above (<NL><END>).

In the examples of this guide, the message terminator is assumed.

## Parameter Types

Data programmed or queried from the power supply is ASCII. The data may be numerical or character string.

### Numeric Parameters

Symbol	Response Formats
<NR1>	Digits with an implied decimal point assumed at the right of the least-significant digit. Examples: 273
<NR2>	Digits with an explicit decimal point. Example: 27.3
<NR3>	Digits with an explicit decimal point and an exponent. Example: 2.73E+02
<b>Parameter Formats</b>	
<NRf>	Extended format that includes <NR1>, <NR2> and <NR3>. Examples: 273 27.3 2.73E+02
<NRf+>	Expanded decimal format that includes <NRf> and MIN, MAX. Examples: 273 27.3 2.73E+02 MAX. MIN and MAX are the minimum and maximum limit values that are implicit in the range specification for the parameter.
<Bool>	Boolean Data. Can be numeric (0, 1), or named (OFF, ON).
<SPD>	String program data. String parameters enclosed in single or double quotes.

### Suffixes and Multipliers

Class	Suffix	Unit	Unit with Multiplier
Current	A	ampere	MA (milliamperere)
Amplitude	V	volt	MV (millivolt)
Time	S	second	MS (millisecond)
<b>Common Multipliers</b>			
1E3	K	kilo	
1E-3	M	milli	
1E-6	U	micro	

### Response Data Types

Symbol	Response Formats
<CRD>	Character Response Data. Returns discrete parameters. Only the short form of the parameter is returned.
<AARD>	Arbitrary ASCII Response Data. Permits the return of undelimited 7-bit ASCII. This data type has an implied message terminator.
<SRD>	String Response Data. Returns string parameters enclosed in double quotes.

## SCPI Command Completion

SCPI commands sent to the power supply are processed either sequentially or in parallel. Sequential commands finish execution before a subsequent command begins. Parallel commands allow other commands to begin executing while the parallel command is still executing.

The following is a list of parallel commands. You should use some form of command synchronization as discussed in this section before assuming that these commands have completed.

```
OUTPut:STATe          INITiate
VOLTage              OUTPut:PROTection:CLEar
CURRent
```

The \*WAI, \*OPC, and \*OPC? common commands provide different ways of indicating when all transmitted commands, including any parallel ones, have completed their operations. Some practical considerations for using these commands are as follows:

**\*WAI** This command prevents the power supply from processing subsequent commands until all pending operations are completed. For example, the \*WAI command can be used to make a voltage measurement after an output on command has completed:

```
OUTPut ON;*WAI::MEASure:VOLTage?
```

**\*OPC?** This command places a 1 in the Output Queue when all pending operations have completed. Because it requires your program to read the returned value before executing the next program statement, \*OPC? can be used to cause the controller to wait for commands to complete before proceeding with its program.

**\*OPC** This command sets the OPC status bit when all pending operations have completed. Since your program can read this status bit on an interrupt basis, \*OPC allows subsequent commands to be executed.

### NOTE

The trigger subsystem must be in the Idle state for the status OPC bit to be true. As far as triggers are concerned, OPC is false whenever the trigger subsystem is in the Initiated state.

## Device Clear

You can send a Device Clear at any time to abort a SCPI command that may be hanging up the GPIB interface. Device Clear clears the input and output buffers of the power supply. The status registers, error queue, and all configuration states are left unchanged by Device Clear. Device Clear also prepares the power supply to accept a new command string. The following statement shows how to send a device clear over the GPIB interface using *Keysight BASIC*:

```
CLEAR 705          IEEE-488 Device Clear
```





# 5

## Language Reference

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This section gives the syntax and parameters for all the IEEE 488.2 SCPI Subsystem commands and Common commands used by the power supply. It is assumed that you are familiar with the material in chapter 4, which explains the terms, symbols, and syntactical structures used here and gives an introduction to programming. You should also be familiar with chapter 3, in order to understand how the power supply functions.

**Subsystem commands** are specific to functions. They can be a single command or a group of commands. The groups are comprised of commands that extend one or more levels below the root. The subsystem commands are arranged alphabetically according to the function they perform.

**Common commands** begin with an \* and consist of three letters (command) or three letters and a ? (query). They are defined by the IEEE 488.2 standard to perform common interface functions. Common commands are grouped along with the subsystem commands according to the function they perform.

## SCPI Command Summary

**NOTE**

Some [optional] commands have been included for clarity. All settings commands have a corresponding query.

### Subsystem Commands

SCPI Command	Description
ABORT	Aborts the triggered action
CALibrate :CURRent[:LEVel] :DATA <NRf> :DATE <"SPD"> :LEVel P1   P2 :PASSword <NRf> :STATE <Bool> [, <NRf>] :VOLTage[:LEVel]	Calibrates the output current programming Enters the calibration value Sets the calibration date Advances to the next calibration step Sets the numeric calibration password Enables/disables calibration mode Calibrates the output voltage programming
INITiate [:IMMediate][:TRANsient] :CONTInuous[:TRANsient]	Initiates the trigger system Enables/disables continuous triggers
MEASure [:SCALar] :CURRent[:DC]? :VOLTage[:DC]?	Returns the measured output current Returns the measured output voltage
OUTPut [:STATe] <Bool> :PON :STATe RST   AUTO :PROTection :CLEar	Enables/disables the specified output Programs the Power-On State Resets latched protection
[SOURce:] CURRent [:LEVel] [:IMMediate][:AMPLitude] <NRf+> :TRIGgered[:AMPLitude] <NRf+> :PROTection :STATe <Bool>	Sets the output current Sets the triggered output current Enables/disables over-current protection
VOLTage [:LEVel] [:IMMediate][:AMPLitude] <NRf+> :TRIGgered[:AMPLitude] <NRf+> :LIMit :LOW <NRf+> :PROTection [:LEVel] <NRf+>	Sets the output voltage Sets the triggered output voltage Sets the low-voltage limit Sets the over-voltage protection level

SCPI Command	Description
STATus	
:OPERation	
[:EVENT]?	Returns the value of the operation event register
:CONDition?	Returns the value of the operation condition register
:ENABle <NRf>	Enables specific bits in the Event register
:NTRansition<NRf>	Sets the Negative transition filter
:PTRansition<NRf>	Sets the Positive transition filter
:PRESet	Presets all enable and transition registers to power-on
:QUEStionable	
[:EVENT]?	Returns the value of the questionable event register
:CONDition?	Returns the value of the questionable condition register
:ENABle <NRf>	Enables specific bits in the Event register
:NTRansition<NRf>	Sets the Negative transition filter
:PTRansition<NRf>	Sets the Positive transition filter
SYSTem	
:COMMunicate	
:RLState LOCAL   REMote   RWLock	Specifies the Remote/Local state of the instrument
:ERRor?	Returns the error number and error string
:VERSion?	Returns the SCPI version number
TRIGger	
:SOURce BUS	Sets the measurement trigger source
[:TRANsient][:IMMediate]	Generates a transient trigger

## Common Commands

Command	Description
*CLS	Clear status
*ESE <NRf>	Standard event status enable
*ESE?	Return standard event status enable
*ESR?	Return event status register
*IDN?	Return instrument identification
*OPC	Enable "operation complete" bit in ESR
*OPC?	Return a "1" when operation complete
*OPT?	Return option number
*RCL <NRf>	Recalls a saved instrument state
*RST	Reset
*SAV <NRf>	Saves an instrument state
*SRE <NRf>	Set service request enable register
*SRE?	Return service request enable register
*STB?	Return status byte
*TRG	Trigger
*TST	Always returns a "0"
*WAI	Holds off bus until all device commands done

## Calibration Commands

Calibration commands let you enable and disable the calibration mode, change the calibration password, calibrate current and voltage programming, and store new calibration constants in nonvolatile memory.

**NOTE**

If calibration mode has not been enabled with CALibrate:STATe, the calibration commands will generate an error.

### **CALibrate:CURRENT[:LEVel]**

This command initiates the calibration of the output current.

### **CALibrate:DATA <value>**

This command enters a calibration value that you obtain by reading an external meter. You must first select a calibration level (with CALibrate:LEVel) for the value being entered. Data values are entered in either volts or amperes, depending on which function is being calibrated.

### **CALibrate:DATE <"date">**

#### **CALibrate:DATE?**

This command stores the date the unit was last calibrated. The data must be of the numeric format "yyyy/mm/dd" where yyyy indicates the year, mm indicates the month, and dd indicates the day. The query returns the date.

### **CALibrate:LEVel P1|P2**

This command selects the next point in the calibration sequence.  
**P1** is the first calibration point,  
**P2** is the second calibration point.

### **CALibrate:PASSword <password>**

This command lets you change the calibration password. A new password is automatically stored in nonvolatile memory. If the password is set to 0, password protection is removed and the ability to enter calibration mode is unrestricted. The default password is 0 (zero).

**CALibrate:STATE ON|OFF [ ,<password>]**  
**CALibrate:STATE?**

This command enables/disables calibration mode. Calibration mode must be enabled for the power supply to accept any other calibration commands. The first parameter specifies the enabled or disabled state On (1) or Off (0). The second parameter is the password.

A password is required if calibration mode is being enabled and the existing password is not 0. If the password is not entered or is incorrect, an error is generated and the calibration mode remains disabled. The query returns only the state, not the password.

The \*RST value = Off.

**CALibrate:VOLTage[:LEVEL]**

This command initiates the calibration of the output voltage.

## Measure Commands

Measure commands measure the output voltage or current. MEASure commands acquire new data before returning the reading. Measurement overflows return a reading of 9.91E+37.

**MEASure[:SCALar]:CURRENT[:DC]?**

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

These queries perform a measurement and return the DC output current in amperes or DC output voltage in volts.

## Output Commands

Output commands enable the output, power-on, and protection functions.

**OUTPut[:STaTe] ON|OFF**  
**OUTPut[:STaTe]?**

This command enables or disables the specified output(s). The enabled state is On (1); the disabled state is Off (0). The state of a disabled output is a condition of zero output voltage and a zero source current (see \*RST). The query returns 0 if the output is off, and 1 if the output is on. The \*RST value = Off.

**OUTPut:PON:STaTe RST|AUTO**  
**OUTPut:PON:STaTe?**

This command determines if the power-on state will be determined by the reset state, or the settings the unit had when it was turned off. RST programs the unit to the reset state; AUTO programs the unit to the settings it had when it was turned off. The power-on state information is saved on non-volatile memory.

Refer to \*RST and \*RCL under System Commands for details.

**OUTPut:PROTection:CLEar**

This command clears the latched signals that have disabled the output. The over-voltage and over-current conditions are always latching. The over-temperature condition, AC-fail condition, Enable pins, and SO pins are latching if OUTPut:PON:STaTe is RST, and non-latching if OUTPut:PON:STaTe is AUTO.

All conditions that generate the fault must be removed before the latch can be cleared. The output is then restored to the state it was in before the fault condition occurred.

## Source Commands

Source commands program the voltage, current, triggered, and protection functions.

```
[SOURCE:]CURRENT[:LEVEL][:IMMEDIATE][:AMPLITUDE] <value>|MIN|MAX
[SOURCE:]CURRENT[:LEVEL][:IMMEDIATE][:AMPLITUDE]? [MIN|MAX]
[SOURCE:]CURRENT[:LEVEL]:TRIGGERED[:AMPLITUDE] <value>|MIN|MAX
[SOURCE:]CURRENT[:LEVEL]:TRIGGERED[:AMPLITUDE]? [MIN|MAX]
```

These commands set the immediate and the triggered output current level. The values are programmed in amperes. The immediate level is the output current setting. The triggered level is a stored value that is transferred to the output when a trigger occurs. At \*RST, the immediate and triggered current values = 0.

```
[SOURCE:]CURRENT:PROTECTION:STATE ON|OFF
[SOURCE:]CURRENT:PROTECTION:STATE?
```

This command enables or disables the over-current protection (OCP) function. The enabled state is On (1); the disabled state is Off (0). If the over-current protection function is enabled and the output goes into constant current operation, the output is disabled and OC is set in the Questionable Condition status register. The \*RST value = Off.

An over-current condition can be cleared with the Output Protection Clear command after the cause of the condition is removed.

```
[SOURCE:]VOLTAGE[:LEVEL][:IMMEDIATE][:AMPLITUDE] <value>|MIN|MAX
[SOURCE:]VOLTAGE[:LEVEL][:IMMEDIATE][:AMPLITUDE]? [MIN|MAX]
[SOURCE:]VOLTAGE[:LEVEL]:TRIGGERED[:AMPLITUDE] <value>|MIN|MAX
[SOURCE:]VOLTAGE[:LEVEL]:TRIGGERED[:AMPLITUDE]? [MIN|MAX]
```

These commands set the immediate and the triggered output voltage level. The values are programmed in volts. The immediate level is the output voltage setting. The triggered level is a stored value that is transferred to the output when a trigger occurs. At \*RST, the immediate and triggered voltage values = 0.

The range of values that can be programmed for these commands is coupled with the voltage protection and the voltage limit low settings. The maximum value for the immediate and triggered voltage level is either the value in the following table, or the voltage protection setting divided by 1.05; whichever is lower. The minimum value is either the value in the table, or the low voltage setting divided by 0.95; whichever is higher.

Note that triggered values can be programmed outside these limits, but an error will be generated when the trigger occurs.

Model (V rating)	6V	8V	12.5V	20V	30V	40V	60V	80V	100V	150V	300V	600V
Min. voltage level	0	0	0	0	0	0	0	0	0	0	0	0
Max. voltage level	6.3	8.4	13.12	21	31.5	41.9	62.85	83.8	104.7	157.1	314.2	628.5

**[SOURCE:]VOLTage:LIMit:LOW <value>|MIN|MAX**  
**[SOURCE:]VOLTage:LIMit:LOW? [MIN|MAX]**

This command sets the low voltage limit of the output. When a low voltage limit has been set, the instrument will ignore any programming commands that attempt to set the output voltage below the low voltage limit. The \*RST value = Max.

The range of values that can be programmed for this command is coupled with the immediate voltage level setting. The maximum value for the low voltage limit is either the value in the following table, or the immediate voltage setting multiplied by 0.95; whichever is lower. The minimum setting is the value in the table.

Model (V rating)	6V	8V	12.5V	20V	30V	40V	60V	80V	100V	150V	300V	600V
Min. low limit	0	0	0	0	0	0	0	0	0	0	0	0
Max. low limit	5.7	7.6	11.9	19	28.5	38	57	76	95	142	285	570

**[SOURCE:]VOLTage:PROTection:LEVel <value>|MIN|MAX**  
**[SOURCE:]VOLTage:PROTection:LEVel? [MIN|MAX]**

This command sets the over-voltage protection (OVP) level of the output. The values are programmed in volts. If the output voltage exceeds the OVP level, the output is disabled and OV is set in the Questionable Condition status register. The \*RST value = Max.

The range of values that can be programmed for this command is coupled with the immediate voltage level setting. The minimum value for the voltage protection level is either the value in the following table, or the immediate voltage setting multiplied by 1.05; whichever is higher. The maximum setting is the value in the table.

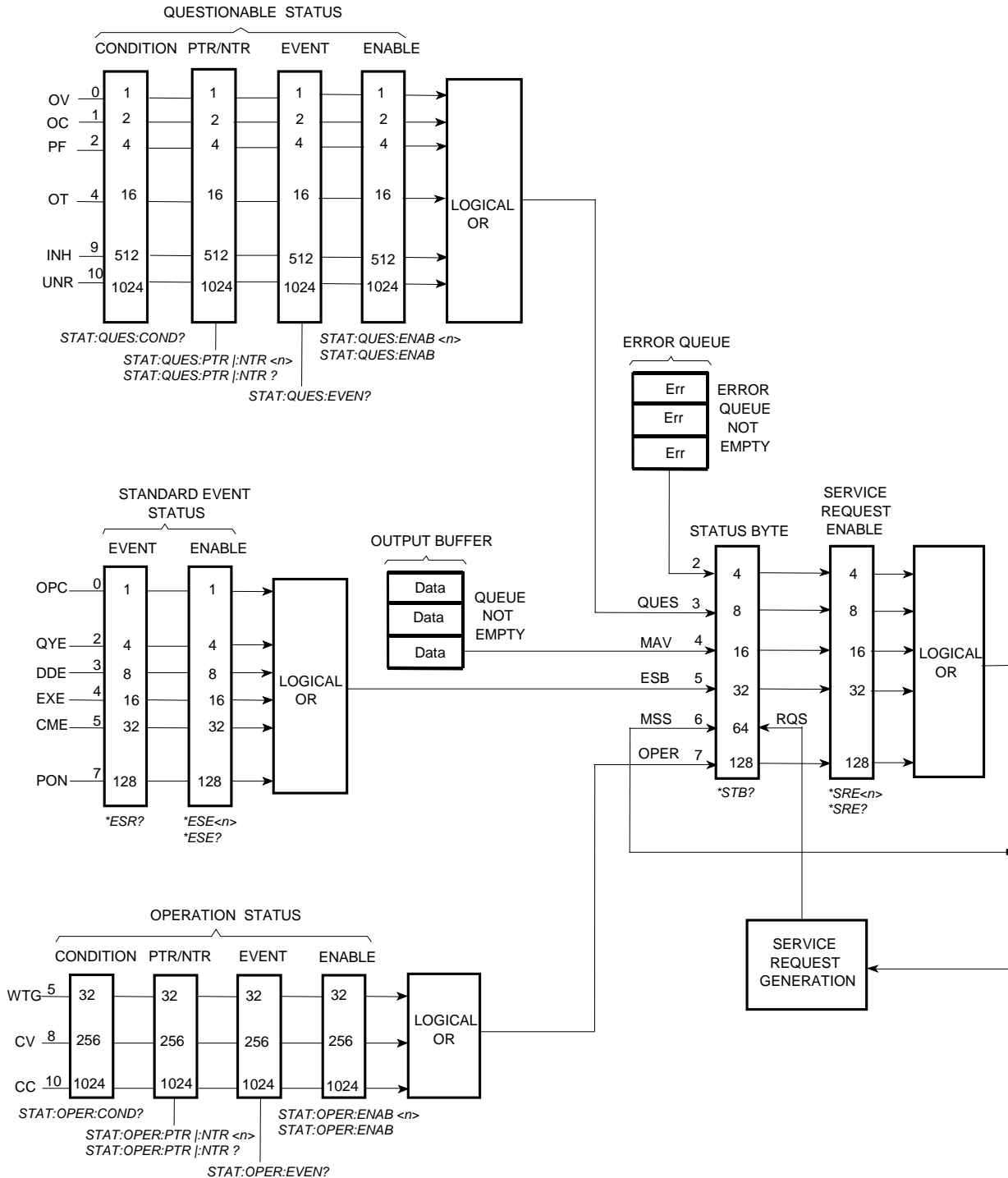
An over-voltage condition can be cleared with the Output Protection Clear command after the condition that caused the OVP trip is removed.

Model (V rating)	6V	8V	12.5V	20V	30V	40V	60V	80V	100V	150V	300V	600V
Min. protection limit	0.5	0.5	1.0	1.0	2.0	2.0	5.0	5.0	5.0	5.0	5.0	5.0
Max. protection limit	7.5	10	15	24	36	44	66	88	110	165	330	660



# Status Commands

Status commands program the power supply's status registers. As shown in the following figure, the power supply has three groups of status registers; Operation, Questionable, and Standard Event. The Operation and Questionable status groups each consist of the Condition, Enable, and Event registers and NTR and PTR filters.



The Standard Event group is programmed with Common commands as described later in this section. Common commands also control additional status functions such as the Service Request Enable and the Status Byte registers.

#### **STATus:PRESet**

This command sets all defined bits in the Operation and Questionable PTR registers. The command clears all defined bits in the Operation and Questionable NTR and Enable registers.

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

This query returns the value of the Operation Event register. The Event register is a read-only register, which stores (latches) all events that are passed by the Operation NTR and/or PTR filter. Reading the Operation Event register clears it. The bit configuration of the Operation status registers is as follows:

Bit Position	15-11	10	9	8	7-6	5	4-0
Bit Value	–	1024	–	256	–	32	–
Bit Name	–	CC	–	CV	–	WTG	–

CC = The output is in constant current

CV = The output is in constant voltage

WTG = The unit is waiting for a transient trigger

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

This query returns the value of the Operation Condition register. That is a read-only register, which holds the live (unlatched) operational status of the power supply.

#### **STATus:OPERation:ENABLE <value>**

#### **STATus:OPERation:ENABLE?**

This command and its query set and read the value of the Operational Enable register. This register is a mask for enabling specific bits from the Operation Event register to set the operation summary bit (OPER) of the Status Byte register. This bit (bit 7) is the logical OR of all the Operational Event register bits that are enabled by the Status Operation Enable register. The Preset value = 0.

**STATUS:OPERation:NTR <value>**  
**STATUS:OPERation:PTR <value>**  
**STATUS:OPERation:NTR?**  
**STATUS:OPERation:PTR?**

These commands set or read the value of the Operation NTR (Negative-Transition) and PTR (Positive-Transition) registers. These registers serve as polarity filters between the Operation Condition and Operation Event registers to cause the following actions:

- When a bit in the Operation NTR register is set to 1, then a 1-to-0 transition of the corresponding bit in the Operation Condition register causes that bit in the Operation Event register to be set.
- When a bit of the Operation PTR register is set to 1, then a 0-to-1 transition of the corresponding bit in the Operation Condition register causes that bit in the Operation Event register to be set.
- If the same bits in both NTR and PTR registers are set to 1, then any transition of that bit at the Operation Condition register sets the corresponding bit in the Operation Event register.
- If the same bits in both NTR and PTR registers are set to 0, then no transition of that bit at the Operation Condition register can set the corresponding bit in the Operation Event register.

The Preset value are: NTR = 0; PTR = 32767

#### **STATUS:QUESTIONable[:EVENT]?**

This query returns the value of the Questionable Event register. The Event register is a read-only register, which stores (latches) all events that are passed by the Questionable NTR and/or PTR filter. Reading the Questionable Event register clears it. The bit configuration of the Questionable status registers is as follows:

Bit Position	15-11	10	9	8-5	4	3	2	1	0
Bit Value	–	1024	512	–	16	–	4	2	1
Bit Name	–	UNR	INH	–	OT	–	PF	OC	OV

UNR = The output is unregulated

INH = The output is turned off by one of the external J1 inhibit signals

OT = The output is disabled by the over-temperature protection

PF = The output is disabled because AC power has failed

OC = The output is disabled by the over-current protection

OV = The output is disabled by the over-voltage protection

#### **STATUS:QUESTIONable:CONDition?**

This query returns the value of the Questionable Condition register. That is a read-only register, which holds the real-time (unlatched) questionable status of the power supply.

**STATUS:QUESTIONABLE:ENABLE <value>**  
**STATUS:QUESTIONABLE:ENABLE?**

This command and its query set and read the value of the Questionable Enable register. This register is a mask for enabling specific bits from the Questionable Event register to set the questionable summary bit (QUES) of the Status Byte register. This bit (bit 3) is the logical OR of all the Questionable Event register bits that are enabled by the Questionable Status Enable register. The Preset value = 0.

**STATUS:QUESTIONABLE:NTR <value>**  
**STATUS:QUESTIONABLE:PTR <value>**  
**STATUS:QUESTIONABLE:NTR?**  
**STATUS:QUESTIONABLE:PTR?**

These commands set or read the value of the Questionable NTR (Negative-Transition) and PTR (Positive-Transition) registers. These registers serve as polarity filters between the Questionable Condition and Questionable Event registers to cause the following actions:

- When a bit of the Questionable NTR register is set to 1, then a 1-to-0 transition of the corresponding bit of the Questionable Condition register causes that bit in the Questionable Event register to be set.
- When a bit of the Questionable PTR register is set to 1, then a 0-to-1 transition of the corresponding bit in the Questionable Condition register causes that bit in the Questionable Event register to be set.
- If the same bits in both NTR and PTR registers are set to 1, then any transition of that bit at the Questionable Condition register sets the corresponding bit in the Questionable Event register.
- If the same bits in both NTR and PTR registers are set to 0, then no transition of that bit at the Questionable Condition register can set the corresponding bit in the Questionable Event register.

The Preset values are: NTR = 0; PTR = 32767

#### **\*CLS**

This command causes the following actions on the status system:

- Clears the Standard Event Status, Operation Status Event, and Questionable Status Event registers
- Clears the Status Byte and the Error Queue
- If \*CLS immediately follows a program message terminator (<NL>), then the output queue and the MAV bit are also cleared.

**\*ESE**  
**\*ESE?**

This command programs the Standard Event Status Enable register bits. The programming determines which events of the Standard Event Status Event register (see \*ESR?) are allowed to set the ESB (Event Summary Bit) of the Status Byte register. A "1" in the bit position enables the corresponding event.

All of the enabled events of the Standard Event Status Event Register are logically OR-ed to cause the Event Summary Bit (ESB) of the Status Byte Register to be set. The query reads the Standard Event The query reads the Standard Event Status Enable register. The bit configuration of the Standard Event register is as follows:

Bit Position	7	6	5	4	3	2	1	0
Bit Value	128	–	32	16	8	4	–	1
Bit Name	PON	–	CME	EXE	DDE	QUE	–	OPC

PON = Power-on has occurred                      DDE = Device-dependent error  
CME = Command error                                QUE = Query error  
EXE = Execution error                                OPC = Operation complete

**\*ESR?**

This query reads the Standard Event Status Event register. Reading the register clears it. The bit configuration is the same as the Standard Event Status Enable register (see \*ESE).

**\*OPC**  
**\*OPC?**

This command causes the instrument to set the OPC bit (bit 0) of the Standard Event Status register when the instrument has completed all pending operations. *Pending operations* are complete when:

- All commands sent before \*OPC have been executed. This includes overlapped commands. Most commands are sequential and are completed before the next command is executed. Commands that affect output voltage, current or state, relays, and trigger actions are executed in parallel (or overlapped) with subsequent commands sent to the power supply. The \*OPC command provides notification that all overlapped commands have been completed.
- All triggered actions are completed

\*OPC does not prevent processing of subsequent commands, but bit 0 will not be set until all pending operations are completed.

\*OPC? causes the instrument to place an ASCII "1" in the Output Queue when all pending operations are completed. Unlike \*OPC, \*OPC? prevents processing of all subsequent commands. It can be used at the end of a command line so that the program can monitor the bus for data until it receives the "1" from the Output Queue.

**\*SRE****\*SRE?**

This command sets the condition of the Service Request Enable Register. This register determines which bits from the Status Byte Register are allowed to set the Master Status Summary (MSS) bit and the Request for Service (RQS) summary bit. A 1 in any Service Request Enable Register bit position enables the corresponding Status Byte Register bit and all such enabled bits then are logically OR-ed to cause Bit 6 of the Status Byte Register to be set.

When the controller conducts a serial poll in response to SRQ, the RQS bit is cleared, but the MSS bit is not. When \*SRE is cleared (by programming it with 0), the power supply cannot generate an SRQ to the controller. The query returns the current state of \*SRE.

**\*STB?**

This query reads the Status Byte register, which contains the status summary bits and the Output Queue MAV bit. Reading the Status Byte register does not clear it. The input summary bits are cleared when the appropriate event registers are read. The MAV bit is cleared at power-on, by \*CLS' or when there is no more response data available.

A serial poll also returns the value of the Status Byte register, except that bit 6 returns Request for Service (RQS) instead of Master Status Summary (MSS). A serial poll clears RQS, but not MSS. When MSS is set, it indicates that the power supply has one or more reasons for requesting service.

Bit Position	7	6	5	4	3	2	1 – 0
Bit Value	128	64	32	16	8	4	–
Bit Name	OPER	MSS	ESB	MAV	QUES	ERR	–
		(RQS)					

OPER = Operation status  
summary

MSS = Master status summary

(RQS) = Request for service

ESB = Event status byte summary

MAV = Message available

QUES = Questionable status  
summary

ERR = Error queue not empty

**\*WAI**

This command instructs the power supply not to process any further commands until all pending operations are completed. Pending operations are as defined under the \*OPC command. \*WAI can be aborted only by sending the power supply a Device Clear command.

## System Commands

System commands control system functions that are not directly related to output control, measurement, or status functions. Common commands are also used to control system functions.

### **SYSTem:COMMunicate:RLState LOCAL | REMote | RWLock SYSTem:COMMunicate:RLState?**

This command configures the remote/local state of the instrument according to the following settings.

- LOCAL** The instrument is set to front panel control (front panel keys are active).
- REMote** The instrument is set to remote interface control (front panel keys are active).
- RWLock** The front panel keys are disabled (the instrument can only be controlled via the remote interface).

The remote/local state can also be set by interface commands over the GPIB and some other I/O interfaces. When multiple remote programming interfaces are active, the interface with the most recently changed remote/local state determines the instrument's remote/local state.

The remote/local state is unaffected by \*RST or any SCPI commands other than SYSTem:COMMunicate:RLState. At power-on however, the communications setting always returns to LOCAL.

### **SYSTem:COMMunicate:TCPIP:CONTROL?**

This query returns the control connection port number. This is used to open a control socket connection to the instrument. Refer to chapter 4 under "Using Sockets" for more information.

### **SYSTem:ERROR?**

This query returns the next error number and its corresponding message string from the error queue. The queue is a FIFO (first-in, first-out) buffer that stores errors as they occur. As it is read, each error is removed from the queue. When all errors have been read, the query returns 0, NO ERROR. If more errors are accumulated than the queue can hold, the last error in the queue will be -350, TOO MANY ERRORS (see Appendix C for error codes).

### **SYSTem:VERSion?**

This query returns the SCPI version number to which the instrument complies. The returned value is of the form YYYY.V, where YYYY represents the year and V is the revision number for that year.

**\*IDN?**

This query requests the power supply to identify itself. It returns a string of four fields separated by commas.

<manufacturer>	Manufacturer
xxxxxA	Model number followed by a letter suffix
0	Zero or serial number if available
<A.xx.xx>,<A.xx.xx>	Firmware revision, power supply revision

**\*OPT?**

This query requests the unit to identify any installed options. A 0 indicates no options are installed.

**\*RCL <state>**

This command restores the power supply to a state that was previously stored in memory locations 0 through 15 with the \*SAV command. Note that you can only recall a state from a location that contains a previously-stored state.

**NOTE**

All saved instrument states are lost when the unit is turned off.

**\*RST**

This command resets the power supply to a factory-defined state. This state is defined as follows. Note that \*RST also forces an ABORT command. The \*RST settings are as follows:

CAL:STAT	Off	[SOUR:]CURR:PROT:STAT	Off
INIT:CONT	Off	[SOUR:]VOLT	0
OUTP	Off	[SOUR:]VOLT:LIM	0
[SOUR:]CURR	0	[SOUR:]VOLT:TRIG	0
[SOUR:]CURR:TRIG	0	[SOUR:]VOLT:PROT	MAXimum

**\*SAV <state>**

This command stores the present state of the power supply to memory locations 0 through 15.

**NOTE**

All saved instrument states are lost when the unit is turned off.

**\*TST?**

Does nothing. This query always returns a zero.



## Trigger Commands

Trigger commands consist of the Abort, Trigger, and Initiate commands. Initiate commands initialize the trigger system. Trigger commands control the triggering of the power supply.

### **ABORT**

This command cancels any trigger actions in progress and returns the trigger system to the IDLE state, unless INIT:CONT is enabled. It also resets the WTG bit in the Status Operation Condition register. ABORT is executed at power-on and upon execution of \*RST.

### **INITiate[:IMMediate][:TRANSient]**

This command controls the enabling of output triggers. When a trigger is enabled, a trigger causes the specified triggering action to occur. If the trigger system is not enabled, all triggers are ignored.

### **INITiate:CONTinuous[:TRANSient] ON|OFF INITiate:CONTinuous[:TRANSient]?**

This command continuously initiates output triggers. The enabled state is On (1); the disabled state is Off (0). When disabled, the trigger system must be initiated for each trigger with the INITiate command.

### **TRIGger[:TRANSient][:IMMediate]**

If the trigger system has been initiated, this command generates an immediate output trigger. When sent, the output trigger will:

- Initiate an output change as specified by the CURR:TRIG or VOLT:TRIG settings.
- Clear the WTG bits in the Status Operation Condition register after the trigger action has completed.

### **TRIGger:SOURce BUS TRIGger:SOURce?**

This command selects the trigger source for the output trigger system. Only BUS can be selected as the trigger source.

### **\*TRG**

This command generates a trigger when the trigger source is set to BUS. The command has the same affect as the Group Execute Trigger (<GET>) command.



# 6

## Programming Examples

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This chapter contains several example programs to help you develop programs for your own application. The example programs are for illustration only, and are provided with the assumption that you are familiar with the programming language being demonstrated and the tools used to create and debug procedures. See Chapter 5, “Language Dictionary” for the SCPI command syntax.

You have a royalty-free right to use, modify, reproduce and distribute the example programs (and/or any modified version) in any way you find useful, provided you agree that Keysight Technologies has no warranty, obligations, or liability for any example programs.

The example programs are written in Microsoft Visual Basic 6.0 using the VISA COM IO library. The VISA COM library must be downloaded from the Automation-Ready CD-ROM to use these programs. For information about using VISA COM in another Visual Basic project, refer to “Programming Your Instruments” in the *USB/LAN/GPIB Interfaces Connectivity Guide*, also included on the Automation-Ready CD-ROM.

## Output Programming Example

This program sets the voltage, current, over-voltage, and the over-current protection. It turns the output on and takes a voltage measurement. When done, the program checks for instrument errors and gives a message if there is an error.

```

Sub main_EZ()
  Dim IDN As String
  Dim IOaddress As String
  Dim ErrString As String

  ' This variable controls the voltage
  Dim VoltSetting As Double

  ' This variable measures the voltage
  Dim measVolt As Double

  ' This variable controls the current
  Dim CurrSetting As Double

  ' These variables control the over voltage protection settings
  Dim overVoltSetting As Double

  ' These variables control the over current protection
  Dim overCurrOn As Long

  'These variable are necessary to initialize the VISA COM.
  Dim ioMgr As KeysightRMLib.SRMClS
  Dim Instrument As VisaComLib.FormattedIO488

  ' The following command line provides the program with the VISA name of the
  ' interface that it will communicate with. It is currently set to use GPIB.
  IOaddress = "GPIB0::5::INSTR"

  ' Use the following line for LAN communication
  ' IOaddress="TCPIP0::141.25.36.214"

  ' Use the following line instead for USB communication
  ' IOaddress = "USB0::2391::1799::US00000002"

  ' Initialize the VISA COM communication
  Set ioMgr = New KeysightRMLib.SRMClS
  Set Instrument = New VisaComLib.FormattedIO488
  Set Instrument.IO = ioMgr.Open(IOaddress)

  VoltSetting = 3
  CurrSetting = 1.5           ' amps
  overVoltSetting = 10
  overCurrOn = 1           '1 for on, 0 for off

  With Instrument
    ' Send a power reset to the instrument
    .WriteString "*RST"

    ' Query the instrument for the IDN string
    .WriteString "*IDN?"
    IDN = .ReadString

    ' Set the voltage
    .WriteString "VOLT" & Str$(VoltSetting)
  
```

```
' Set the over voltage level
.WriteString "VOLT:PROT:LEV " & Str$(overVoltSetting)

' Turn on over current protection
.WriteString "CURR:PROT:STAT " & Str$(overCurrOn)

' Set the current level
.WriteString "CURR " & Str$(CurrSetting)

' Turn the output on
.WriteString "OUTP ON"

' Make sure that the output is on before continuing
.WriteString "*OPC?"
.ReadString

' Measure the voltage
.WriteString "Meas:Volt?"
measVolt = .ReadNumber
MsgBox "Measured Voltage is " & Str$(measVolt)

' Check instrument for any errors
.WriteString "Syst:err?"
ErrString = .ReadString

' give message if there is an error
If Val(ErrString) Then
    MsgBox "Error in instrument!" & vbCrLf & ErrString
End If
End With
End Sub
```

## Trigger Programming Example

This example illustrates how to set up and trigger a voltage and current change. The voltage is measured before and after the trigger.

```

Sub main_Trig()
  Dim IDN As String
  Dim IOaddress As String
  Dim ErrString As String
  Dim msg1 As String

  ' This variable is used to monitor the status
  Dim stat As Long

  ' This variable controls the voltage
  Dim VoltSetting As Double

  ' This variable measures the voltage
  Dim MeasureVolt As Double

  ' This variable controls the current
  Dim CurrSetting As Double

  ' This variable represents the trigger current setting
  Dim trigCurrSetting As Double

  ' This variable controls the triggered voltage setting
  Dim trigVoltSetting As Double

  ' This constant represents the register value for Waiting for Trigger
  Const WTG = 32

  ' These variables are necessary to initialize the VISA COM
  Dim ioMgr As KeysightRMLib.SRMClS
  Dim Instrument As VisaComLib.FormattedIO488

  ' The following line provides the VISA name of the GPIB interface
  IOaddress = "GPIB0::5::INSTR"

  ' Use the following line instead for LAN communication
  ' IOaddress="TCPIP0::141.25.36.214"

  ' Use the following line instead for USB communication
  ' IOaddress = "USB0::2391::1799::US00000002"

  ' Initialize the VISA COM communication
  Set ioMgr = New KeysightRMLib.SRMClS
  Set Instrument = New VisaComLib.FormattedIO488
  Set Instrument.IO = ioMgr.Open(IOaddress)

  VoltSetting = 3           ' volts
  CurrSetting = 2           ' amps
  trigVoltSetting = 5       ' volts
  trigCurrSetting = 3       ' amps

  With Instrument
    ' Send a power reset to the instrument
    .WriteString "*RST"

    ' Query the instrument for the IDN string
    .WriteString "*IDN?"
    IDN = .ReadString
  End With
End Sub

```

```

' Set the voltage
.WriteString "VOLT" & Str$(VoltSetting)

' Set the current level
.WriteString "CURR " & Str$(CurrSetting)

' Set the triggered voltage and current levels
.WriteString "VOLT:TRIG " & Str$(trigVoltSetting)
.WriteString "CURR:TRIG " & Str$(trigCurrSetting)

' Turn the output on
.WriteString "OUTP ON"

' Make sure that the output is on
.WriteString "*OPC?"
.ReadString

' Measure the voltage before triggering the change
.WriteString "MEAS:VOLT?"
MeasureVolt = .ReadNumber

' Save the value for later display
msg1$ = "Voltage before trigger = " & Str$(MeasureVolt)

' Initiate the trigger system
.WriteString "INIT"

' Make sure that the trigger system is initiated
Do
  .WriteString "STAT:OPER:COND?"
  stat = .ReadNumber
Loop Until ((stat And WTG) = WTG)

' Trigger the unit
.WriteString "*TRG"

' Make sure that the trigger is done
.WriteString "*OPC?"
.ReadString

' Measure the voltage after triggering the change
.WriteString "MEAS:VOLT?"
MeasureVolt = .ReadNumber

' Display the measured values
MsgBox msg1$ + Chr$(13) + "Voltage after trigger = " & Str$(MeasureVolt)

' Check instrument for any errors
.WriteString "Syst:err?"
ErrString = .ReadString

' Give message if there is an error
If Val(ErrString) Then
  MsgBox "Error in instrument!" & vbCrLf & ErrString
End If
End With
End Sub

```





# Appendix A

## Specifications

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This chapter lists the specifications and supplemental characteristics of the Keysight N5700 power supplies. A dimensional line drawing of the unit is included at the end of the chapter.

Unless otherwise noted, specifications are warranted over the ambient temperature range of 0 to 40°C. Sensing is at the rear terminals of the power supply after a 30-minute warm-up period. Sense terminals are externally jumpered to their respective output terminals.

Supplemental characteristics are not warranted but are descriptions of typical performance determined either by design or type testing.

## Performance Specifications

## Keysight Models N5741A – N5752A and N5761A – N5772A

Model	N5741A N5761A	N5742A N5762A	N5743A N5763A	N5744A N5764A	N5745A N5765A	N5746A N5766A	N5747A N5767A	N5748A N5768A	N5749A N5769A	N5750A N5770A	N5751A N5771A	N5752A N5772A
<b>DC Output Ratings:</b> <sup>NOTE 1</sup>												
Voltage	6V	8V	12.5V	20V	30V	40V	60V	80V	100V	150V	300V	600V
Current 750W	100A	90A	60A	38A	25A	19A	12.5A	9.5A	7.5A	5A	2.5A	1.3A
Current 1500W	180A	165A	120A	76A	50A	38A	25A	19A	15A	10A	5A	2.6A
Power 750W	600W	720W	750W	760W	750W	760W	750W	760W	750W	750W	750W	780W
Power 1500W	1080W	1320W	1500W	1520W	1500W	1520W	1500W	1520W	1500W	1500W	1500W	1560W
<b>Output Ripple and Noise:</b>												
CV p-p <sup>NOTE 2</sup>	60mV	60mV	60mV	60mV	60mV	60mV	60mV	80mV	80mV	100mV	150mV	300mV
CV rms <sup>NOTE 3</sup>	8mV	8mV	8mV	8mV	8mV	8mV	8mV	8mV	8mV	8mV	12mV	60mV
<b>Load Effect:</b> (change from 10% to 90% of full load)												
Voltage	2.6mV	2.8mV	3.25mV	4mV	5mV	6mV	8mV	10mV	12mV	17mV	32mV	62mV
Current 750W	25mA	23mA	17mA	12.6mA	10mA	8.8mA	7.5mA	6.9mA	6.5mA	6mA	5.5mA	5.26mA
Current 1500W	41mA	38mA	29mA	20.2mA	15mA	12.6mA	10mA	8.8mA	8mA	7mA	6mA	5.5mA
<b>Source Effect:</b> (change from 85-132 VAC input or 170-265 VAC input)												
Voltage	2.6mV	2.8mV	3.25mV	4mV	5mV	6mV	8mV	10mV	12mV	17mV	32mV	62mV
Current 750W	12mA	11mA	8mA	5.8mA	4.5mA	3.9mA	3.25mA	2.95mA	2.75mA	2.5mA	2.25mA	2.13mA
Current 1500W	20mA	18.5mA	14mA	9.6mA	7mA	5.8mA	4.5mA	3.9mA	3.5mA	3mA	2.5mA	2.26mA
<b>Programming Accuracy:</b> <sup>NOTE 1</sup>												
Voltage 0.05%+	3mV	4mV	6.25mV	10mV	15mV	20mV	30mV	40mV	50mV	75mV	150mV	300mV
Current 750W 0.1%+	100mA	90mA	60mA	38mA	25mA	19mA	12.5mA	9.5mA	7.5mA	5mA	2.5mA	1.3mA
Current 1500W 0.1%+	180mA	165mA	120mA	76mA	50mA	38mA	25mA	19mA	15mA	10mA	5mA	2.6mA
<b>Measurement Accuracy:</b>												
Voltage 0.1%+	6mV	8mV	12.5mV	20mV	30mV	40mV	60mV	80mV	100mV	150mV	300mV	600mV
Current 750W 0.1%+	300mA	270mA	180mA	114mA	75mA	57mA	37.5mA	28.5mA	22.5mA	15mA	7.5mA	3.9mA
Current 1500W 0.1%+	540mA	495mA	360mA	228mA	150mA	114mA	75mA	57mA	45mA	30mA	15mA	7.8mA
<b>Load Transient Recovery Time:</b> (time for output voltage to recover within 0.5% of its rated output for a load change from 10 to 90% of its rated output current)												
Time	≤ 1.5ms	≤ 1.5ms	≤ 1.5ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 2ms	≤ 2ms
Voltage set point	from 10% to 100% of rated output											

<sup>NOTE 1</sup> Minimum voltage is guaranteed to a maximum of 0.2% of the rated output voltage.  
Minimum current is guaranteed to a maximum of 0.4% of the rated output current.

<sup>NOTE 2</sup> 20MHz

<sup>NOTE 3</sup> From 5Hz - 1MHz

## Supplemental Characteristics

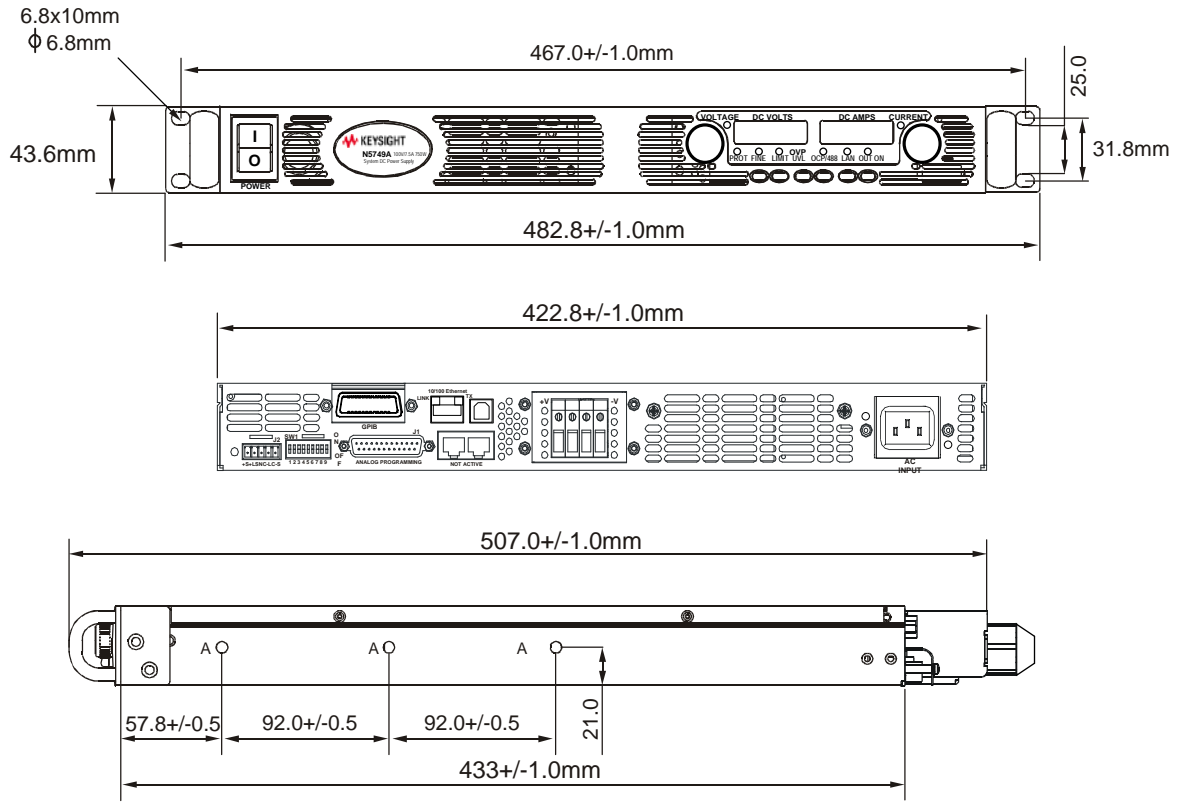
## Keysight Models N5741A – N5752A and N5761A – N5772A

Model	N5741A N5761A	N5742A N5762A	N5743A N5763A	N5744A N5764A	N5745A N5765A	N5746A N5766A	N5747A N5767A	N5748A N5768A	N5749A N5769A	N5750A N5770A	N5751A N5771A	N5752A N5772A
<b>Output Response Time:</b> (to settle to within $\pm 1.0\%$ of the rated output, with a resistive load)												
Up, full load	0.08s	0.08s	0.08s	0.08s	0.08s	0.08s	0.08s	0.15s	0.15s	0.15s	0.15s	0.25s
Down, full load	0.05s	0.05s	0.05s	0.05s	0.08s	0.08s	0.08s	0.15s	0.15s	0.15s	0.15s	0.30s
Down, no load	0.5s	0.6s	0.7s	0.8s	0.9s	1.0s	1.1s	1.2s	1.5s	2.0s	3.0s	4s
<b>Command Response Time:</b> (add this to the output response time to obtain the total programming time)												
	55 ms											
<b>Remote Sense Compensation:</b>												
Volts/load lead	1V	1V	1V	1V	1.5V	2V	3V	4V	5V	5V	5V	5V
<b>Over-voltage Protection:</b>												
Range	0.5-7.5V	0.5-10V	1-15V	1-24V	2-36V	2-44V	5-66V	5-88V	5-110V	5-165V	5-330V	5-660V
Accuracy	0.06V	0.08V	0.125V	0.20V	0.30V	0.40V	0.60V	0.80V	1V	1.5V	3V	6V
<b>Output Ripple and Noise:</b> (From 5Hz-1MHz, at 10% to 100% of output voltage at full load (for 6V units from 33% to 100% of output voltage)												
CC rms 750W	200mA	180mA	120mA	76mA	63mA	48mA	38mA	29mA	23mA	18mA	13mA	8mA
CC rms 1500W	360mA	330mA	240mA	152mA	125mA	95mA	75mA	57mA	45mA	35mA	25mA	12mA
<b>Programming Resolution:</b>												
<b>Measurement Resolution:</b>												
Voltage	0.72mV	0.96mV	1.5mV	2.4mV	3.6mV	4.8mV	7.2mV	9.6mV	12mV	18mV	36mV	72mV
Current 750W	12mA	10.8mA	7.2mA	4.56mA	3mA	2.3mA	1.5mA	1.14mA	0.9mA	0.6mA	0.3mA	0.156mA
Current 1500W	21.6mA	19.8mA	14.4mA	9.12mA	6mA	4.6mA	3mA	2.28mA	1.8mA	1.2mA	0.6mA	0.312mA
<b>Front Panel Display Accuracy:</b> (4 digits; +% of rated output; $\pm 1$ count)												
Voltage	30mV	40mV	62.5mV	100mV	150mV	200mV	300mV	400mV	500mV	750mV	1.5 V	3 V
Current 750W	500mA	450mA	300mA	190mA	125mA	95mA	62.5mA	47.5mA	37.5mA	25mA	12.5mA	6.5mA
Current 1500W	900mA	825mA	600mA	380mA	250mA	190mA	125mA	95mV	75mA	50mA	25m	13mA
<b>Temperature Drift:</b> (over 8 hours, after a 30 minute warm-up, with constant line, load, and temperature)												
Voltage	3mV	4mV	6.25mV	10mV	15mV	20mV	30mV	40mV	50mV	75mV	150mV	300mV
Current 750W	50mA	45mA	30mA	19mA	12.5mA	9.5mA	6.25mA	4.75mA	3.75mA	2.5mA	1.25mA	6.5mA
Current 1500W	90mA	82.5mA	60mA	38mA	25mA	19mA	12.5mA	9.5mA	7.5mA	5mA	2.5mA	1.3mA
<b>Temperature Coefficient:</b> (after a 30 minute warm-up)												
Voltage and Current	100 PPM/ $^{\circ}$ C from rated output voltage or current											
<b>Analog Programming and Monitoring:</b>												
Vout voltage	0 - 100%, 0-5V/10V, user selectable, Accuracy & linearity = +/-0.5% of rated Vout											
Iout voltage	0 - 100%, 0-5V/10V, user selectable, Accuracy & linearity = +/-1% of rated Iout											
Vout resistance	0 - 100%, 0-5k $\Omega$ /10k $\Omega$ , user selectable, Accuracy & linearity = +/-1% of rated Vout											
Iout resistance	0 - 100%, 0-5k $\Omega$ /10k $\Omega$ , user selectable, Accuracy & linearity = +/-1.5% of rated Iout											
Iout monitor	0-5V/10V, user selectable, Accuracy = 1%											
Vout monitor	0-5V/10V, user selectable, Accuracy = 1%											
On/Off control	Electrical voltage; 0-6V/2-15V or dry contact, user selectable logic											
PS OK signal	5V = OK; 0V = FAIL; 500 $\Omega$ series resistance											
CV/CC signal	CV = TTL high (4-5V) source current 10mA; CC = TTL high (4-5V) sink current 10mA											
Enable/Disable	Dry contact. Open=Off, Short=On. Maximum voltage at terminal= 6V.											

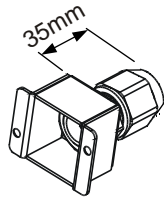
## Keysight Models N5741A – N5752A and N5761A – N5772A

Model	N5741A N5761A	N5742A N5762A	N5743A N5763A	N5744A N5764A	N5745A N5765A	N5746A N5766A	N5747A N5767A	N5748A N5768A	N5749A N5769A	N5750A N5770A	N5751A N5771A	N5752A N5772A
<b>Series and Parallel Capability:</b>												
Parallel operation	Up to 4 identical units can be connected in master/slave mode with single-wire current balancing											
Series operation	Up to 2 identical units can be connected using external protection diodes											
<b>Savable states:</b>												
In volatile memory	16 (in memory locations 0-15)											
<b>Interface Capabilities:</b>												
GPIO	SCPI - 1993, IEEE 488.2 compliant interface											
LXI Compliance	LXI Core 2011 (only applies to units with the LXI label on the front panel)											
USB 2.0	Requires Keysight IO Library version L.01.01 and up, or 14.0 and up											
10/100 LAN	Requires Keysight IO Library version L.01.01 and up, or 14.0 and up											
<b>Environmental Conditions:</b>												
Environment	Indoor use, installation category II (AC input), pollution degree 2											
Operating temp.	0°C to 40°C @ 100% load											
Storage temp.	-20°C to 70°C											
Operating humidity	Up to 90% relative humidity (no condensation)											
Storage humidity	10% to 95% relative humidity (no condensation)											
Altitude	Up to 3000 meters. Above 2000m, derate the output current by 2%/100m <b>and</b> derate the maximum ambient temperature by 1°C/100m. (For 1500W models from 60V to 600V, derate either the output current or the ambient temperature, but not both.)											
<b>Regulatory Compliance:</b>												
EMC	Complies with European EMC Directive for test and measurement products. <ul style="list-style-type: none"> <li>• IEC/EN 61326-1</li> <li>• CISPR 11, Group 1, class A</li> <li>• AS/NZS CISPR 11</li> <li>• ICES/NMB-001</li> </ul> Complies with the Australian standard and carries the C-Tick mark. This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme à la norme NMB-001 du Canada.											
Safety	Complies with the European Low Voltage Directive and carries the CE-marking. Conforms to UL 61010-1 and CSA C22.2 61010-1.											
<b>Acoustic Noise Declaration:</b>												
Statements provided to comply with requirements of the German Sound Emission Directive, from 18 January 1991: Sound Pressure Lp <70 dB(A), * At Operator Position, * Normal Operation, * According to EN 27779 (Type Test). Schalldruckpegel Lp <70 dB(A) * Am Arbeitsplatz, * Normaler Betrieb, * Nach EN 27779 (Typprüfung).												
<b>Output Terminal Isolation:</b>												
6V to 60V units	No output terminal may be more than +/- 60 VDC from any other terminal or chassis ground											
80V to 600V units	No output terminal may be more than +/- 600 VDC from any other terminal or chassis ground											
<b>AC Input:</b>												
Nominal Input	100 – 240 VAC; 50/60Hz											
Input Current 750W	10.5A @ 100 VAC nominal; 5A @ 200 VAC nominal											
Input Current 1500W	21A @ 100 VAC nominal; 11A @ 200 VAC nominal											
Input Range	85 – 265 VAC; 47 – 63 Hz.											
Power Factor	0.99 at nominal input and rated output power											
Efficiency	76% – 87% for 750W units; 77% – 88% for 1500W units											
Inrush Current	< 25A for 750W units; < 50 A for 1500W units											

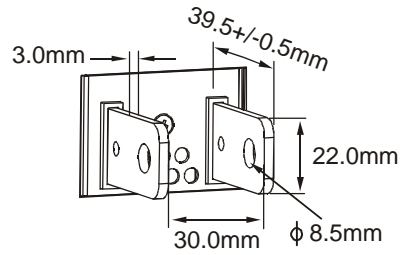
# Outline Diagram



**Strain-Relief Detail**  
1500W Models



**Bus-Bar Detail**  
6V to 60V Models



**NOTES:**

Holes marked "A" are for chassis slide mounting.  
Use only screws designated #10-32x0.38" maximum.



# Appendix B

## Verification and Calibration

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Calibration .....	115

The verification procedures described in this appendix verify that the power supply is operating normally and is within published specifications.

This appendix also includes calibration procedures for the Keysight N5700 power supplies. Instructions are given for performing the procedures from a controller over the GPIB.

### NOTE

Perform the verification tests before calibrating your power supply. If the power supply passes the verification tests, the unit is operating within its calibration limits and does not need to be re-calibrated.

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The recommended calibration interval for Keysight N5700 power supplies is one year.

## Verification

Verification procedures verify that the power supply is operating normally and is within published specifications. There are two types of verification tests:

**Performance** These tests verify that the power supply meets all of the specifications listed in Appendix A. They can also be used to verify that the power supply is properly calibrated.

**Calibration** These procedures calibrate the power supply.

If the power supply fails any of the tests or if abnormal test results are obtained, try calibrating the unit. If calibration is unsuccessful, return the unit to a Keysight Technologies repair facility (see Appendix D).

## Equipment Required

The equipment listed in the following table, or the equivalent to this equipment, is required for the calibration and performance tests. A test record sheet may be found at the back of this section.

Type	Specifications	Recommended Model
Digital Voltmeter	Resolution: 10 nV @ 1V; Readout: 8 1/2 digits Accuracy: 20 ppm	Keysight 3458A or equivalent
Current Monitor	15 A (0.1 $\Omega$ ) 0.04%, TC=5ppm/ $^{\circ}$ C 100 A (0.01 $\Omega$ ) 0.04%, TC=5ppm/ $^{\circ}$ C 300 A (0.001 $\Omega$ ) 0.04%, TC=5ppm/ $^{\circ}$ C	Guidline 9230/15 Guidline 9230/100 Guidline 9230/300
Load Resistor	For 750 W models: 0.06 $\Omega$ , 0.09 $\Omega$ , 0.21 $\Omega$ , 0.53 $\Omega$ , 1.20 $\Omega$ , 2.11 $\Omega$ , 4.80 $\Omega$ , 8.42 $\Omega$ , 13.33 $\Omega$ , 30.0 $\Omega$ , 120 $\Omega$ , 462 $\Omega$ - all resistors 1kW minimum. For 1500 W models: 0.03 $\Omega$ , 0.04 $\Omega$ , 0.10 $\Omega$ , 0.26 $\Omega$ , 0.60 $\Omega$ , 1.05 $\Omega$ , 2.40 $\Omega$ , 4.21 $\Omega$ , 6.67 $\Omega$ , 15.0 $\Omega$ , 60 $\Omega$ , 231 $\Omega$ - all resistors 2kW minimum.	
Electronic Load	150 V, 100 A minimum (for Models N5741- N5750A) 150 V, 180 A minimum (for Models N5761- N5770A)	Keysight N3300A mainframe, with 3 - N3305A modules
GPIB Controller	Full GPIB capabilities (for calibrating the unit over the GPIB)	Keysight 82350B or equivalent
Oscilloscope	Sensitivity: 1 mV Bandwidth Limit: 20 MHz Probe: 1:1 with RF tip	Keysight Infiniium or equivalent
RMS Voltmeter	True RMS Bandwidth: 20 MHz Sensitivity: 100 $\mu$ V	Rhode and Schwartz Model URE3 or equivalent
Differential Amplifier	Bandwidth: 20 MHz	LeCroy DA1855A, DA1850A, or equivalent
Differential Probe	100:1/10:1 selectable	LeCroy DXC100A or equivalent
Terminations	1 - 50 $\Omega$ BNC termination	
Variable-voltage xfmr or AC source	Adjustable to highest rated input voltage range. Power: 2000 VA	Keysight 6813B or equivalent



## Measurement Techniques

### Electronic Load

Many of the test procedures require the use of a variable load capable of dissipating the required power. If a variable resistor is used, switches should be used to either; connect, disconnect, or short the load resistor. For most tests, an electronic load can be used. The electronic load is considerably easier to use than load resistors, but it may not be fast enough to test transient recovery time and may be too noisy for the noise (PARD) tests.

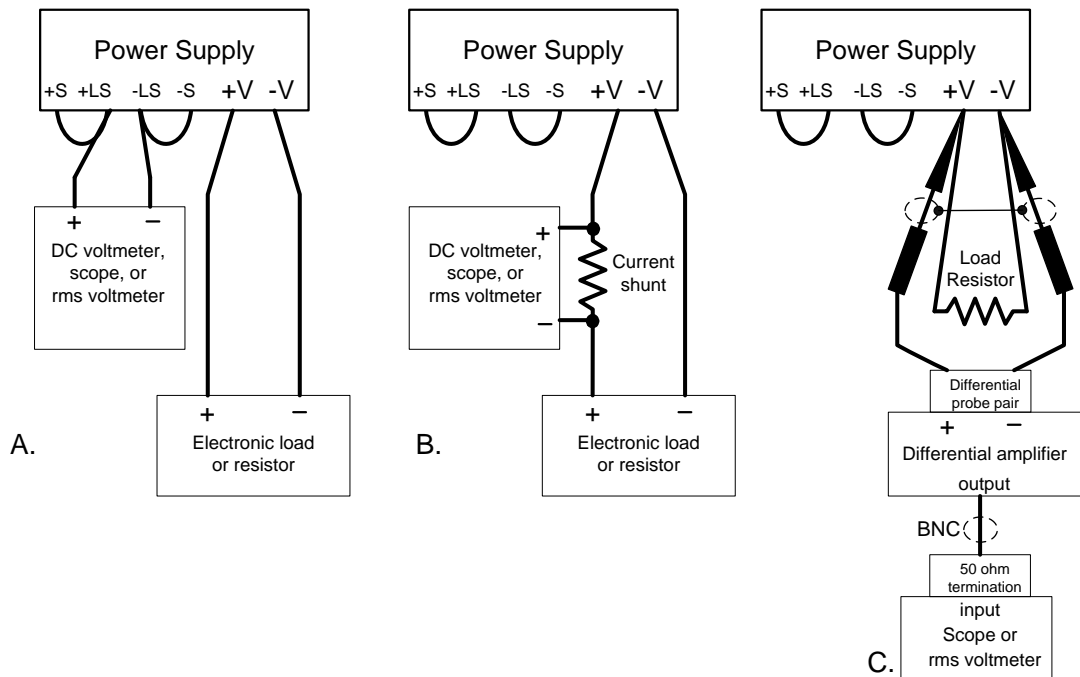
Fixed load resistors may be used in place of a variable load, with minor changes to the test procedures. Also, if computer controlled test setups are used, the relatively slow (compared to computers and system voltmeters) settling times and slew rates of the power supply may have to be taken into account. "Wait" statements can be used in the test program if the test system is faster than the power supply.

### Current-Monitoring Resistor

The 4-terminal current shunt is used to eliminate output current measurement error caused by voltage drops in the load leads and connections. It has special current-monitoring terminals inside the load connection terminals. Connect the voltmeter directly to these current-monitoring terminals.

### Test Set-up

The following figure illustrates the test set-up used for the verification procedures.



**WARNING**

**SHOCK HAZARD** Before starting the verification procedures, check to make sure that the startup mode is set to Safe-Start (see page 42).

---

## Constant Voltage Tests

Refer to the appropriate test record in the following section for the instrument settings for each of the following tests.

### Voltage Programming and Readback Accuracy

*Test category = performance, calibration*

This test verifies that the voltage programming and measurement functions are within specifications.

- 1 Turn off the power supply and connect a DVM directly across the +S and -S terminals as shown in figure A. Do not connect a load.
- 2 Turn on the power supply and program the output voltage to zero and the output current to its maximum programmable value ( $I_{max}$ ) with the load off. The CV annunciator should be on and the output current reading should be approximately zero.
- 3 Record the output voltage readings on the digital voltmeter (DVM) as well as the measurement readback. The readings should be within the limits specified in the test record card for the appropriate model under Voltage Programming and Readback, Minimum Voltage  $V_{out}$ .
- 4 Program the output voltage to its full-scale rating.
- 5 Record the output voltage readings on the DVM as well as the measurement readback. The readings should be within the limits specified in the test record card for the appropriate model under Voltage Programming and Readback, High Voltage  $V_{out}$ .

### CV Load Effect

*Test category = performance*

This test measures the change in output voltage resulting from a change in output current from full load to no load.

- 1 Turn off the power supply and connect a DVM and an electronic load as shown in figure A.
- 2 Turn on the power supply and program the output current to its maximum programmable value ( $I_{max}$ ) and the output voltage to its full-scale value.
- 3 Set the electronic load for the output's full-scale current. The CV annunciator on the front panel must be on. If it is not, adjust the load so that the output current drops slightly.
- 4 Record the output voltage reading from the DVM.
- 5 Open the load and record the voltage reading from the DVM again. The difference between the DVM readings in steps 4 and 5 is the load effect, which should not exceed the value listed in the test record card for the appropriate model under CV Load Effect.

## CV Source Effect

*Test category = performance*

This test measures the change in output voltage that results from a change in AC line voltage from the minimum to maximum value within the line voltage specifications.

- 1** Turn off the power supply and connect the ac power line through a variable voltage transformer.
- 2** Connect a DVM and an electronic load as shown in figure A. Set the variable voltage transformer to nominal line voltage.
- 3** Turn on the power supply and program the output current to its maximum programmable value ( $I_{max}$ ) and the output voltage to its full-scale value.
- 4** Set the electronic load for the output's full-scale current. The CV annunciator on the front panel must be on. If it is not, adjust the load so that the output current drops slightly.
- 5** Adjust the transformer to the low-line voltage (85 VAC for 100/120 nominal line; 170 VAC for 200/240 nominal line).
- 6** Record the output voltage reading from the DVM.
- 7** Adjust the transformer to the high-line voltage (132 VAC for 100/120 nominal line; 265 VAC for 200/240 nominal line).
- 8** Record the output voltage reading on the DVM. The difference between the DVM reading in steps 6 and 8 is the source effect, which should not exceed the value listed in the test record card for the appropriate model under CV Source Effect.

## CV Noise

*Test category = performance*

Periodic and random deviations in the output combine to produce a residual AC voltage superimposed on the DC output voltage. This residual voltage is specified as the rms or peak-to-peak output voltage in the frequency range specified in Appendix A.

- 1** Turn off the power supply and connect the load resistor, differential amplifier, and an oscilloscope (ac coupled) to the output as shown in figure C. Use the indicated load resistor for 750W outputs; use the indicated load resistor for 1500W outputs.
- 2** As shown in the diagram, use the differential probe to connect the differential amplifier to the + and - output terminals. The shields of the two probes should be connected together. Connect the output of the differential amplifier to the oscilloscope with a 50  $\Omega$  termination at the input of the oscilloscope.
- 3** Set the differential amplifier to multiply by ten, divide by one, and 1 Megohm input resistance. The positive and negative inputs of the differential amplifier should be set to AC coupling. Set the oscilloscope's time base to 5 ms/div, and the vertical scale to 10 mV/div. Turn the bandwidth limit on (usually 20 or 30 MHz), and set the sampling mode to peak detect.

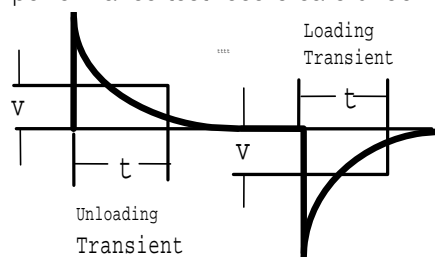
- 4 Program the power supply to program the output current to its maximum programmable value ( $I_{max}$ ) and the output voltage to its full-scale value and enable the output. Let the oscilloscope run for a few seconds to generate enough measurement points. On the Keysight Infiniium scope, the maximum peak-to-peak voltage measurement is indicated at the bottom of the screen on the right side. Divide this value by 10 to get the CV peak-to-peak noise measurement. The result should not exceed the peak-to-peak limits in the test record form for the appropriate model under CV Ripple and Noise, peak-to-peak.  
(If the measurement contains any question marks, clear the measurement and try again. This means that some of the data received by the scope was questionable.)
- 5 Disconnect the oscilloscope and connect an ac rms voltmeter in its place. Do not disconnect the  $50\ \Omega$  termination. Divide the reading of the rms voltmeter by 10. The result should not exceed the rms limits in the test record card for the appropriate model under CV Ripple and Noise - rms.

### Transient Recovery Time

*Test category = performance*

This measures the time for the output voltage to recover to within the specified value following a 10% to 90% change in the load current.

- 1 Turn off the power supply and connect the output as in figure A with the oscilloscope across the +S and -S terminals.
- 2 Turn on the power supply and program the output current to its maximum programmable value ( $I_{max}$ ) and the output voltage to its full-scale value. **Do not program voltages greater than 200 VDC when testing the 300 and 600 volt models.**
- 3 Set the electronic load to operate in constant current mode. Program its load current to 10% of the power supply's full-scale current value.
- 4 Set the electronic load's transient generator frequency to 100 Hz and its duty cycle to 50%.
- 5 Program the load's transient current level to 90% of the power supply's full-scale current value. Turn the transient generator on.
- 6 Adjust the oscilloscope for a waveform similar to that shown in the following figure.
- 7 The output voltage should return to within the specified voltage in the specified time following the 10% to 90% load change. Check both loading and unloading transients by triggering on the positive and negative slope. Record the voltage at time "t" in the performance test record card under Transient Response.



## Constant Current Tests

Refer to the appropriate test record in the following section for the instrument settings for each of the following tests.

### Current Programming and Readback Accuracy

*Test category = performance, calibration*

This test verifies that the current programming and measurement functions are within specifications.

- 1** Turn off the power supply and connect the current shunt directly across the output. Connect the DVM across the current shunt.
- 2** Turn on the power supply and program the output voltage to its full-scale value and the output current to zero. The CC annunciator should be on and the output voltage reading should be approximately zero.
- 3** Divide the voltage drop (DVM reading) across the current shunt by its resistance to convert to amps and record this value (Iout). Also record the current measurement readback. The readings should be within the limits specified in the test record card for the appropriate model under Current Programming and Readback, Minimum Current Iout.
- 4** Program the output current to its full-scale rating.
- 5** Divide the voltage drop (DVM reading) across the current shunt by its resistance to convert to amps and record this value (Iout). Also record the current measurement readback. The readings should be within the limits specified in the test record card for the appropriate model under Current Programming and Readback, High Current Iout.

### CC Load Effect

*Test category = performance*

This test measures the change in output current resulting from a change in output voltage from full scale to short circuit.

- 1** Turn off the power supply and connect the current shunt, DVM, and electronic load as shown in figure B. Connect the DVM directly across the current shunt.
- 2** To ensure that the values read during this test are not the instantaneous measurement of the AC peaks of the output current ripple, several DC measurements should be made and averaged. With a Keysight 3458A, you can set the voltmeter to do this automatically. From the instrument's front panel, program 100 power line cycles per measurement. Press NPLC 100 ENTER.
- 3** Turn on the power supply and program the output current to its full-scale value and the output voltage to its maximum programmable value (Vmax).
- 4** With the electronic load in CV mode, set it for the output's full-scale voltage. The CC annunciator on the front panel must be on. If it is not, adjust the load so that the voltage drops slightly.

- 5** Divide the voltage drop (DVM reading) across the current monitoring resistor by its resistance to convert to amps and record this value (Iout).
- 6** Short the electronic load. Divide the voltage drop (DVM reading) across the current shunt by its resistance to convert to amps and record this value (Iout). The difference in the current readings in steps 4 and 5 is the load effect, which should not exceed the value listed in the test record card for the appropriate model under CC Load Effect.

### CC Source Effect

*Test category = performance*

This test measures the change in output current that results from a change in AC line voltage from the minimum to maximum value within the line voltage specifications.

- 1** Turn off the power supply and connect the ac power line through a variable voltage transformer or AC source.
- 2** Connect the current shunt, DVM, and electronic load as shown in figure B. Connect the DVM directly across the current shunt. Set the variable voltage transformer to nominal line voltage.
- 3** To ensure that the values read during this test are not the instantaneous measurement of the AC peaks of the output current ripple, several DC measurements should be made and averaged. If you are using a Keysight 3458A, you can set up the voltmeter to do this automatically. From the instrument's front panel, program 100 power line cycles per measurement. Press NPLC 100 ENTER.
- 4** Turn on the power supply and program the output current to its full-scale value and the output voltage to its maximum programmable value (Vmax).
- 5** With the electronic load in CV mode, set it for the output's full-scale voltage. The CC annunciator on the front panel must be on. If it is not, adjust the load so that the voltage drops slightly.
- 6** Adjust the transformer to the lowest rated line voltage (85 VAC for 100/120 nominal line; 170 VAC for 200/240 nominal line).
- 7** Divide the voltage drop (DVM reading) across the current monitoring resistor by its resistance to convert to amps and record this value (Iout).
- 8** Adjust the transformer to the highest rated line voltage (132 VAC for 100/120 nominal line; 265 VAC for 200/240 nominal line).
- 9** Divide the voltage drop (DVM reading) across the current shunt by its resistance to convert to amps and record this value (Iout). The difference between the DVM reading in steps 6 and 8 is the source effect, which should not exceed the value listed in the test record card for the appropriate model under CC Source Effect.
- 10** Return the voltage and current settings to zero when verification is completed.

## Test Record Form – Keysight N5741A and N5761A

Keysight N5741A and N5761A	Report No _____	Date _____		
	Model	Minimum Specs.	Results	Maximum Specs.
<b>Voltage Programming &amp; Readback</b>				
Minimum Voltage Vout	Both	12 mV	_____	18 mV
Measurement Readback	Both	Vout – 6 mV	_____	Vout + 6 mV
High Voltage Vout	Both	5.994 V	_____	6.006 V
Measurement Readback	Both	Vout – 12 mV	_____	Vout + 12 mV
<b>CV Load Effect</b>	Both	– 2.6 mV	_____	+ 2.6 mV
<b>CV Source Effect</b>	Both	– 2.6 mV	_____	+ 2.6 mV
<b>CV Ripple and Noise</b>				
peak-to-peak	Both	N/A	_____	60 mV
rms	Both	N/A	_____	8 mV
<b>Transient Response</b>				
Voltage @ 1.5ms	Both	– 30 mV	_____	+ 30 mV
<b>Current Programming &amp; Readback</b>				
Minimum Current Iout	N5741A	400 mA	_____	600 mA
	N5761A	720 mA	_____	1.080 A
Measurement Readback	N5741A	Iout – 300 mA	_____	Iout + 300 mA
	N5761A	Iout – 540 mA	_____	Iout + 540 mA
High Current Iout	N5741A	99.8 A	_____	100.2 A
	N5761A	179.64 A	_____	180.3 A
Measurement Readback	N5741A	Iout – 400 mA	_____	Iout + 400 mA
	N5761A	Iout – 720 mA	_____	Iout + 720 mA
<b>CC Load Effect</b>	N5741A	– 25 mA	_____	+ 25 mA
	N5761A	– 41 mA	_____	+ 41 mA
<b>CC Source Effect</b>	N5741A	– 12 mA	_____	+ 12 mA
	N5761A	– 20 mA	_____	+ 20 mA

**WARNING** Return the voltage and current settings to zero when verification is completed

Test Description	N5741A Settings	N5761A Settings
Voltage Programming & Readback, Min Voltage	15 mV, 500 mA	15 mV, 900 mA
Voltage Programming & Readback, High Voltage	6 V, 500 mA	6 V, 900 mA
CV Load Effect, Source Effect, Ripple and Noise	6 V, 100 A	6 V, 180 A
Transient Response	6 V, from 10 A to 90A	6 V, from 18 A to 172A
Current Programming & Readback, Min Current	500 mA, 6 V	900 mA, 6 V
Current Programming & Readback, High Current	100 A, 6 V	180 A, 6 V
CC Load Effect, Source Effect	100 A, 6 V	180 A, 6 V

Load Requirements	N5741A	N5761A
Current shunt	0.01Ω 100 A	0.001Ω 300 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	0.06Ω 1kW	0.03Ω 2kW

## Test Record Form – Keysight N5742A and N5762A

Keysight N5742A and N5762A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	16 mV _____ 24 mV
Measurement Readback	Both	Vout – 8 mV _____ Vout + 8 mV
High Voltage Vout	Both	7.992 V _____ 8.008 V
Measurement Readback	Both	Vout – 16 mV _____ Vout + 16 mV
<b>CV Load Effect</b>	Both	– 2.8 mV _____ + 2.8 mV
<b>CV Source Effect</b>	Both	– 2.8 mV _____ + 2.8 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 60 mV
rms	Both	N/A _____ 8 mV
<b>Transient Response</b>		
Voltage @ 1.5ms	Both	– 40 mV _____ + 40 mV
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5742A	360 mA _____ 540 mA
	N5762A	660 mA _____ 990 mA
Measurement Readback	N5742A	Iout – 270 mA _____ Iout + 270 mA
	N5762A	Iout – 495 mA _____ Iout + 495 mA
High Current Iout	N5742A	89.82 A _____ 90.18 A
	N5762A	164.67 A _____ 165.33 A
Measurement Readback	N5742A	Iout – 360 mA _____ Iout + 360 mA
	N5762A	Iout – 660 mA _____ Iout + 660 mA
<b>CC Load Effect</b>	N5742A	– 23 mA _____ + 23 mA
	N5762A	– 38 mA _____ + 38 mA
<b>CC Source Effect</b>	N5742A	– 11 mA _____ + 11 mA
	N5762A	– 18.5 mA _____ + 18.5 mA

**WARNING**

Return the voltage and current settings to zero when verification is completed

Test Description	N5742A Settings	N5762A Settings
Voltage Programming & Readback, Min Voltage	20 mV, 450 mA	20 mV, 825 mA
Voltage Programming & Readback, High Voltage	8 V, 450 mA	8 V, 825 mA
CV Load Effect, Source Effect, Ripple and Noise	8 V, 90 A	8 V, 165 A
Transient Response	8 V, from 9 A to 81A	8 V, from 16.5 A to 148.5A
Current Programming & Readback, Min Current	450 mA, 8 V	825 mA, 8 V
Current Programming & Readback, High Current	90 A, 8 V	165 A, 8 V
CC Load Effect, Source Effect	90 A, 8 V	165 A, 8 V
<b>Load Requirements</b>		
	<b>N5742A</b>	<b>N5762A</b>
Current shunt	0.01Ω 100 A	0.001Ω 300 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	0.09Ω 1kW	0.04Ω 2kW



### Test Record Form – Keysight N5743A and N5763A

Keysight N5743A and N5763A	Report No _____	Date _____		
Description	Model	Minimum Specs.	Results	Maximum Specs.
<b>Voltage Programming &amp; Readback</b>				
Minimum Voltage Vout	Both	25 mV	_____	37.5 mV
Measurement Readback	Both	Vout – 12.5 mV	_____	Vout + 12.5 mV
High Voltage Vout	Both	12.4875 V	_____	12.5125 V
Measurement Readback	Both	Vout – 25 mV	_____	Vout + 25 mV
<b>CV Load Effect</b>	Both	– 3.25 mV	_____	+ 3.25 mV
<b>CV Source Effect</b>	Both	– 3.25 mV	_____	+ 3.25 mV
<b>CV Ripple and Noise</b>				
peak-to-peak	Both	N/A	_____	60 mV
rms	Both	N/A	_____	8 mV
<b>Transient Response</b>				
Voltage @ 1.5ms	Both	– 62 mV	_____	+ 62 mV
<b>Current Programming &amp; Readback</b>				
Minimum Current Iout	N5743A	240 mA	_____	360 mA
	N5763A	480 mA	_____	720 mA
Measurement Readback	N5743A	Iout – 180 mA	_____	Iout + 180 mA
	N5763A	Iout – 360 mA	_____	Iout + 360 mA
High Current Iout	N5743A	59.88 A	_____	60.12 A
	N5763A	119.76 A	_____	120.24 A
Measurement Readback	N5743A	Iout – 240 mA	_____	Iout + 240 mA
	N5763A	Iout – 480 mA	_____	Iout + 480 mA
<b>CC Load Effect</b>	N5743A	– 17 mA	_____	+ 17 mA
	N5763A	– 29 mA	_____	+ 29 mA
<b>CC Source Effect</b>	N5743A	– 8 mA	_____	+ 8 mA
	N5763A	– 14 mA	_____	+ 14 mA

**WARNING** Return the voltage and current settings to zero when verification is completed

Test Description	N5743A Setting	N5763A Setting
Voltage Programming & Readback, Min Voltage	31.3 mV, 300 mA	31.3 mV, 600 mA
Voltage Programming & Readback, High Voltage	12.5 V, 300 mA	12.5 V, 600 mA
CV Load Effect, Source Effect, Ripple and Noise	12.5 V, 60 A	12.5 V, 120 A
Transient Response	12.5 V, from 6 A to 54A	12.5 V, from 12 A to 108 A
Current Programming & Readback, Min Current	300 mA, 12.5 V	600 mA, 12.5 V
Current Programming & Readback, High Current	60 A, 12.5 V	120 A, 12.5 V
CC Load Effect, Source Effect	60 A, 12.5 V	120 A, 12.5 V
<b>Load Requirements</b>		
	<b>N5743A</b>	<b>N5763A</b>
Current shunt	0.01Ω 100 A	0.001Ω 300 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	0.21Ω 1kW	0.10Ω 2kW

## Test Record Form – Keysight N5744A and N5764A

Keysight N5744A and N5764A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	40 mV _____ 60 mV
Measurement Readback	Both	Vout – 20 mV _____ Vout + 20 mV
High Voltage Vout	Both	19.98 V _____ 20.02 V
Measurement Readback	Both	Vout – 40 mV _____ Vout + 40 mV
<b>CV Load Effect</b>	Both	– 4 mV _____ + 4 mV
<b>CV Source Effect</b>	Both	– 4 mV _____ + 4 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 60 mV
rms	Both	N/A _____ 8 mV
<b>Transient Response</b>		
Voltage @ 1ms	Both	– 100 mV _____ + 100 mV
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5744A	152 mA _____ 228 mA
	N5764A	304 mA _____ 456 mA
Measurement Readback	N5744A	Iout – 114 mA _____ Iout + 114 mA
	N5764A	Iout – 228 mA _____ Iout + 228 mA
High Current Iout	N5744A	37.924 A _____ 38.076 A
	N5764A	75.848 A _____ 76.152 A
Measurement Readback	N5744A	Iout – 152 mA _____ Iout + 152 mA
	N5764A	Iout – 304 mA _____ Iout + 304 mA
<b>CC Load Effect</b>	N5744A	– 12.6 mA _____ + 12.6 mA
	N5764A	– 20.2 mA _____ + 20.2 mA
<b>CC Source Effect</b>	N5744A	– 5.8 mA _____ + 5.8 mA
	N5764A	– 9.6 mA _____ + 9.6 mA

**WARNING** Return the voltage and current settings to zero when verification is completed

Test Description	N5744A Setting	N5764A Setting
Voltage Programming & Readback, Min Voltage	50 mV, 190 mA	50 mV, 380 mA
Voltage Programming & Readback, High Voltage	20 V, 190 mA	20 V, 380 mA
CV Load Effect, Source Effect, Ripple and Noise	20 V, 38 A	20 V, 76 A
Transient Response	20 V, from 3.8 A to 34.2 A	20 V, from 7.6 A to 68.4 A
Current Programming & Readback, Min Current	190 mA, 20 V	380 mA, 20 V
Current Programming & Readback, High Current	38 A, 20 V	76 A, 20 V
CC Load Effect, Source Effect	38 A, 20 V	76 A, 20 V
<b>Load Requirements</b>		
Current shunt	0.01Ω 100 A	0.01Ω 100 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	0.53Ω 1kW	0.26Ω 2kW

## Test Record Form – Keysight N5745A and N5765A

Keysight N5745A and N5765A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	60 mV _____ 90 mV
Measurement Readback	Both	Vout – 30 mV _____ Vout + 30 mV
High Voltage Vout	Both	29.97 V _____ 30.03 V
Measurement Readback	Both	Vout – 60 mV _____ Vout + 60 mV
<b>CV Load Effect</b>	Both	– 5 mV _____ + 5 mV
<b>CV Source Effect</b>	Both	– 5 mV _____ + 5 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 60 mV
rms	Both	N/A _____ 8 mV
<b>Transient Response</b>		
Voltage @ 1ms	Both	– 150 mV _____ + 150 mV
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5745A	100 mA _____ 150 mA
	N5765A	200 mA _____ 300 mA
Measurement Readback	N5745A	Iout – 75 mA _____ Iout + 75 mA
	N5765A	Iout – 150 mA _____ Iout + 150 mA
High Current Iout	N5745A	24.95 A _____ 25.05 A
	N5765A	49.9 A _____ 50.1 A
Measurement Readback	N5745A	Iout – 100 mA _____ Iout + 100 mA
	N5765A	Iout – 200 mA _____ Iout + 200 mA
<b>CC Load Effect</b>	N5745A	– 10 mA _____ + 10 mA
	N5765A	– 15 mA _____ + 15 mA
<b>CC Source Effect</b>	N5745A	– 4.5 mA _____ + 4.5 mA
	N5765A	– 7 mA _____ + 7 mA

**WARNING**

Return the voltage and current settings to zero when verification is completed

Test Description	N5745A Setting	N5765A Setting
Voltage Programming & Readback, Min Voltage	75 mV, 125 mA	75 mV, 250 mA
Voltage Programming & Readback, High Voltage	30 V, 125 mA	30 V, 250 mA
CV Load Effect, Source Effect, Ripple and Noise	30 V, 25 A	30 V, 50 A
Transient Response	30 V, from 2.5 A to 22.5 A	30 V, from 5 A to 45 A
Current Programming & Readback, Min Current	125 mA, 30 V	250 mA, 30 V
Current Programming & Readback, High Current	25 A, 30 V	50 A, 30 V
CC Load Effect, Source Effect	25 A, 30 V	50 A, 30 V
<b>Load Requirements</b>		
Current shunt	0.01Ω 100 A	0.01Ω 100 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	1.20Ω 1kW	0.60Ω 2kW

## Test Record Form – Keysight N5746A and N5766A

Keysight N5746A and N5766A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	80 mV _____ 120 mV
Measurement Readback	Both	Vout – 40 mV _____ Vout + 40 mV
High Voltage Vout	Both	39.96 V _____ 40.04 V
Measurement Readback	Both	Vout – 80 mV _____ Vout + 80 mV
<b>CV Load Effect</b>	Both	– 6 mV _____ + 6 mV
<b>CV Source Effect</b>	Both	– 6 mV _____ + 6 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 60 mV
rms	Both	N/A _____ 8 mV
<b>Transient Response</b>		
Voltage @ 1ms	Both	– 200 mV _____ + 200 mV
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5746A	76 mA _____ 114 mA
	N5766A	152 mA _____ 228 mA
Measurement Readback	N5746A	Iout – 57 mA _____ Iout + 57 mA
	N5766A	Iout – 114 mA _____ Iout + 114 mA
High Current Iout	N5746A	18.962 A _____ 19.038 A
	N5766A	37.924 A _____ 38.076 A
Measurement Readback	N5746A	Iout – 76 mA _____ Iout + 76 mA
	N5766A	Iout – 152 mA _____ Iout + 152 mA
<b>CC Load Effect</b>	N5746A	– 8.8 mA _____ + 8.8 mA
	N5766A	– 12.6 mA _____ + 12.6 mA
<b>CC Source Effect</b>	N5746A	– 3.9 mA _____ + 3.9 mA
	N5766A	– 5.8 mA _____ + 5.8 mA

**WARNING**

Return the voltage and current settings to zero when verification is completed

Test Description	N5746A Setting	N5766A Setting
Voltage Programming & Readback, Min Voltage	100 mV, 95 mA	100 mV, 190 mA
Voltage Programming & Readback, High Voltage	40 V, 95 mA	40 V, 190 mA
CV Load Effect, Source Effect, Ripple and Noise	40 V, 19 A	40 V, 38 A
Transient Response	40 V, from 1.9 A to 17.1 A	40 V, from 3.8 A to 34.2 A
Current Programming & Readback, Min Current	95 mA, 40 V	190 mA, 40 V
Current Programming & Readback, High Current	19 A, 40 V	38 A, 40 V
CC Load Effect, Source Effect	19 A, 40 V	38 A, 40 V
<b>Load Requirements</b>		
Current shunt	0.01Ω 100 A	0.01Ω 100 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	2.11Ω 1kW	1.05Ω 2kW

## Test Record Form – Keysight N5747A and N5767A

Keysight N5747A and N5767A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	120 mV _____ 180 mV
Measurement Readback	Both	Vout – 60 mV _____ Vout + 60 mV
High Voltage Vout	Both	59.94 V _____ 60.06 V
Measurement Readback	Both	Vout – 120 mV _____ Vout + 120 mV
<b>CV Load Effect</b>	Both	– 8 mV _____ + 8 mV
<b>CV Source Effect</b>	Both	– 8 mV _____ + 8 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 60 mV
rms	Both	N/A _____ 8 mV
<b>Transient Response</b>		
Voltage @ 1ms	Both	– 300 mV _____ + 300 mV
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5747A	50 mA _____ 75 mA
	N5767A	100 mA _____ 150 mA
Measurement Readback	N5747A	Iout – 37.5 mA _____ Iout + 37.5 mA
	N5767A	Iout – 75 mA _____ Iout + 75 mA
High Current Iout	N5747A	12.475 A _____ 12.525 A
	N5767A	24.95 A _____ 25.05 A
Measurement Readback	N5747A	Iout – 50 mA _____ Iout + 50 mA
	N5767A	Iout – 100 mA _____ Iout + 100 mA
<b>CC Load Effect</b>	N5747A	– 7.5 mA _____ + 7.5 mA
	N5767A	– 10 mA _____ + 10 mA
<b>CC Source Effect</b>	N5747A	– 3.25 mA _____ + 3.25 mA
	N5767A	– 4.5 mA _____ + 4.5 mA

**WARNING** Return the voltage and current settings to zero when verification is completed

Test Description	N5747A Setting	N5767A Setting
Voltage Programming & Readback, Min Voltage	150 mV, 62.5 mA	150 mV, 125 mA
Voltage Programming & Readback, High Voltage	60 V, 62.5 mA	60 V, 125 mA
CV Load Effect, Source Effect, Ripple and Noise	60 V, 12.5 A	60 V, 25 A
Transient Response	60 V, from 1.25 A to 11.25 A	60 V, from 2.5 A to 22.5 A
Current Programming & Readback, Min Current	62.5 mA, 60 V	125 mA, 60 V
Current Programming & Readback, High Current	12.5 A, 60 V	25 A, 60 V
CC Load Effect, Source Effect	12.5 A, 60 V	25 A, 60 V
<b>Load Requirements</b>		
	<b>N5747A</b>	<b>N5767A</b>
Current shunt	0.1Ω 15 A	0.01Ω 100 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	4.8Ω 1kW	2.4Ω 2kW

## Test Record Form – Keysight N5748A and N5768A

Keysight N5748A and N5768A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	160 mV _____ 240 mV
Measurement Readback	Both	Vout – 80 mV _____ Vout + 80 mV
High Voltage Vout	Both	79.92 V _____ 80.08 V
Measurement Readback	Both	Vout – 160 mV _____ Vout + 160 mV
<b>CV Load Effect</b>	Both	– 10 mV _____ + 10 mV
<b>CV Source Effect</b>	Both	– 10 mV _____ + 10 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 80 mV
rms	Both	N/A _____ 8 mV
<b>Transient Response</b>		
Voltage @ 1ms	Both	– 400 mV _____ + 400 mV
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5748A	76 mA _____ 114 mA
	N5768A	0 mA _____ 96 mA
Measurement Readback	N5748A	Iout – 28.5 mA _____ Iout + 28.5 mA
	N5768A	Iout – 57 mA _____ Iout + 57 mA
High Current Iout	N5748A	9.481 A _____ 9.519 A
	N5768A	18.962 A _____ 19.038 A
Measurement Readback	N5748A	Iout – 38 mA _____ Iout + 38 mA
	N5768A	Iout – 76 mA _____ Iout + 76 mA
<b>CC Load Effect</b>	N5748A	– 6.9 mA _____ + 6.9 mA
	N5768A	– 8.8 mA _____ + 8.8 mA
<b>CC Source Effect</b>	N5748A	– 2.95 mA _____ + 2.95 mA
	N5768A	– 3.9 mA _____ + 3.9 mA

**WARNING**

Return the voltage and current settings to zero when verification is completed

Test Description	N5748A Setting	N5768A Setting
Voltage Programming & Readback, Min Voltage	200 mV, 47.5 mA	200 mV, 95 mA
Voltage Programming & Readback, High Voltage	80 V, 47.5 mA	80 V, 95 mA
CV Load Effect, Source Effect, Ripple and Noise	80 V, 9.5 A	80 V, 19 A
Transient Response	80 V, from 0.95 A to 8.55 A	80 V, from 1.9 A to 17.1 A
Current Programming & Readback, Min Current	47.5 mA, 80 V	95 mA, 80 V
Current Programming & Readback, High Current	9.5 A, 80 V	19 A, 80 V
CC Load Effect, Source Effect	9.5 A, 80 V	19 A, 80 V
<b>Load Requirements</b>		
Current shunt	0.1Ω 15 A	0.01Ω 100 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	8.42Ω 1kW	4.21Ω 2kW

## Test Record Form – Keysight N5749A and N5769A

Keysight N5749A and N5769A	Report No _____	Date _____		
Description	Model	Minimum Specs.	Results	Maximum Specs.
<b>Voltage Programming &amp; Readback</b>				
Minimum Voltage Vout	Both	200 mV	_____	300 mV
Measurement Readback	Both	Vout – 100 mV	_____	Vout + 100 mV
High Voltage Vout	Both	99.9 V	_____	100.1 V
Measurement Readback	Both	Vout – 200 mV	_____	Vout + 200 mV
<b>CV Load Effect</b>	Both	– 12 mV	_____	+ 12 mV
<b>CV Source Effect</b>	Both	– 12 mV	_____	+ 12 mV
<b>CV Ripple and Noise</b>				
peak-to-peak	Both	N/A	_____	80 mV
rms	Both	N/A	_____	8 mV
<b>Transient Response</b>				
Voltage @ 1ms	Both	– 500 mV	_____	+ 500 mV
<b>Current Programming &amp; Readback</b>				
Minimum Current Iout	N5749A	30 mA	_____	45 mA
	N5769A	60 mA	_____	90 mA
Measurement Readback	N5749A	Iout – 22.5 mA	_____	Iout + 22.5 mA
	N5769A	Iout – 45 mA	_____	Iout + 45 mA
High Current Iout	N5749A	7.485 A	_____	7.515 A
	N5769A	14.97 A	_____	15.03 A
Measurement Readback	N5749A	Iout – 30 mA	_____	Iout + 30 mA
	N5769A	Iout – 60 mA	_____	Iout + 60 mA
<b>CC Load Effect</b>	N5749A	– 6.5 mA	_____	+ 6.5 mA
	N5769A	– 8 mA	_____	+ 8 mA
<b>CC Source Effect</b>	N5749A	– 2.75 mA	_____	+ 2.75 mA
	N5769A	– 3.5 mA	_____	+ 3.5 mA

**WARNING**

Return the voltage and current settings to zero when verification is completed

Test Description	N5749A Setting	N5769A Setting
Voltage Programming & Readback, Min Voltage	250 mV, 37.5 mA	250 mV, 75 mA
Voltage Programming & Readback, High Voltage	100 V, 37.5 mA	100 V, 75 mA
CV Load Effect, Source Effect, Ripple and Noise	100 V, 7.5 A	100 V, 15 A
Transient Response	100 V, from 0.75 A to 6.75 A	100 V, from 1.5 A to 13.5 A
Current Programming & Readback, Min Current	37.5 mA, 100 V	75 mA, 100 V
Current Programming & Readback, High Current	7.5 A, 100 V	15 A, 100 V
CC Load Effect, Source Effect	7.5 A, 100 V	15 A, 100 V
<b>Load Requirements</b>		
	<b>N5749A</b>	<b>N5769A</b>
Current shunt	0.1Ω 15 A	0.1Ω 15 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	13.33Ω 1kW	6.67Ω 2kW

## Test Record Form – Keysight N5750A and N5770A

Keysight N5750A and N5770A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	300 mV _____ 450 mV
Measurement Readback	Both	Vout – 150 mV _____ Vout + 150 mV
High Voltage Vout	Both	149.85 V _____ 150.15 V
Measurement Readback	Both	Vout – 300 mV _____ Vout + 300 mV
<b>CV Load Effect</b>	Both	– 17 mV _____ + 17 mV
<b>CV Source Effect</b>	Both	– 17 mV _____ + 17 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 100 mV
rms	Both	N/A _____ 12 mV
<b>Transient Response</b>		
Voltage @ 2ms	Both	– 750 mV _____ + 750 mV
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5750A	20 mA _____ 30 mA
	N5770A	40 mA _____ 60 mA
Measurement Readback	N5750A	Iout – 15 mA _____ Iout + 15 mA
	N5770A	Iout – 30 mA _____ Iout + 30 mA
High Current Iout	N5750A	4.99 A _____ 5.01 A
	N5770A	9.98 A _____ 10.02 A
Measurement Readback	N5750A	Iout – 20 mA _____ Iout + 20 mA
	N5770A	Iout – 40 mA _____ Iout + 40 mA
<b>CC Load Effect</b>	N5750A	– 6 mA _____ + 6 mA
	N5770A	– 7 mA _____ + 7 mA
<b>CC Source Effect</b>	N5750A	– 2.5 mA _____ + 2.5 mA
	N5770A	– 3 mA _____ + 3 mA

**WARNING** Return the voltage and current settings to zero when verification is completed

Test Description	N5750A Setting	N5770A Setting
Voltage Programming & Readback, Min Voltage	375 mV, 25 mA	375 mV, 50 mA
Voltage Programming & Readback, High Voltage	150 V, 25 mA	150 V, 50 mA
CV Load Effect, Source Effect, Ripple and Noise	150 V, 5 A	150 V, 10 A
Transient Response	150 V, from 0.5 A to 4.5 A	150 V, from 1 A to 9 A
Current Programming & Readback, Min Current	25 mA, 150 V	50 mA, 150 V
Current Programming & Readback, High Current	5 A, 150 V	10 A, 150 V
CC Load Effect, Source Effect	5 A, 150 V	10 A, 150 V
<b>Load Requirements</b>		
Current shunt	0.1Ω 15 A	0.1Ω 15 A
Keysight N3300 Electronic load modules	2 – N3305A	3 – N3305A
Fixed Resistor for CV Ripple and Noise	30.0Ω 1kW	15.0Ω 2kW



## Test Record Form – Keysight N5751A and N5771A

Keysight N5751A and N5771A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	600 mV _____ 900 mV
Measurement Readback	Both	Vout – 300 mV _____ Vout + 300 mV
High Voltage Vout	Both	299.7 V _____ 300.3 V
Measurement Readback	Both	Vout – 600 mV _____ Vout + 600 mV
<b>CV Load Effect</b>	Both	– 32 mV _____ + 32 mV
<b>CV Source Effect</b>	Both	– 32 mV _____ + 32 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 150 mV
rms	Both	N/A _____ 20 mV
<b>Transient Response</b>		
Voltage @ 2ms	Both	– 1 V _____ + 1 V
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5751A	10 mA _____ 15 mA
	N5771A	20 mA _____ 30 mA
Measurement Readback	N5751A	Iout – 7.5 mA _____ Iout + 7.5 mA
	N5771A	Iout – 15 mA _____ Iout + 15 mA
High Current Iout	N5751A	2.495 A _____ 2.505 A
	N5771A	4.99 A _____ 5.01 A
Measurement Readback	N5751A	Iout – 10 mA _____ Iout + 10 mA
	N5771A	Iout – 20 mA _____ Iout + 20 mA
<b>CC Load Effect</b>	N5751A	– 5.5 mA _____ + 5.5 mA
	N5771A	– 6 mA _____ + 6 mA
<b>CC Source Effect</b>	N5751A	– 2.25 mA _____ + 2.25 mA
	N5771A	– 2.5 mA _____ + 2.5 mA

**WARNING** Return the voltage and current settings to zero when verification is completed

Test Description	N5751A Setting	N5771A Setting
Voltage Programming & Readback, Min Voltage	750 mV, 12.5 mA	750 mV, 25 mA
Voltage Programming & Readback, High Voltage	300 V, 12.5 mA	300 V, 25 mA
CV Load Effect, Source Effect, Ripple and Noise	300 V, 2.5 A	300 V, 5 A
Transient Response	200 V, from 0.25 A to 2.25 A	200 V, from 0.5 A to 4.5 A
Current Programming & Readback, Min Current	12.5 mA, 300 V	25 mA, 300 V
Current Programming & Readback, High Current	2.5 A, 300 V	5 A, 300 V
CC Load Effect, Source Effect	2.5 A, 300 V	5 A, 300 V
<b>Load Requirements</b>		
Current shunt	0.1Ω 15 A	0.1Ω 15 A
Use fixed resistor instead of load modules	120Ω 1kW	60Ω 2kW
Fixed Resistor for CV Ripple and Noise	120Ω 1kW	60Ω 2kW

## Test Record Form – Keysight N5752A and N5772A

Keysight N5752A and N5772A	Report No _____	Date _____
Description	Model	Minimum Specs. Results Maximum Specs.
<b>Voltage Programming &amp; Readback</b>		
Minimum Voltage Vout	Both	1.2 V _____ 1.8 V
Measurement Readback	Both	Vout – 600 mV _____ Vout + 600 mV
High Voltage Vout	Both	599.4 V _____ 600.6 V
Measurement Readback	Both	Vout – 1.2 V _____ Vout + 1.2 V
<b>CV Load Effect</b>	Both	– 62 mV _____ + 62 mV
<b>CV Source Effect</b>	Both	– 62 mV _____ + 62 mV
<b>CV Ripple and Noise</b>		
peak-to-peak	Both	N/A _____ 300 mV
rms	Both	N/A _____ 60 mV
<b>Transient Response</b>		
Voltage @ 2ms	Both	– 1 V _____ + 1 V
<b>Current Programming &amp; Readback</b>		
Minimum Current Iout	N5752A	5.2 mA _____ 7.8 mA
	N5772A	10.4 mA _____ 15.6 mA
Measurement Readback	N5752A	Iout – 3.9 mA _____ Iout + 3.9 mA
	N5772A	Iout – 7.8 mA _____ Iout + 7.8 mA
High Current Iout	N5752A	1.2974 A _____ 1.3026 A
	N5772A	2.5948 A _____ 2.6052 A
Measurement Readback	N5752A	Iout – 5.2 mA _____ Iout + 5.2 mA
	N5772A	Iout – 10.4 mA _____ Iout + 10.4 mA
<b>CC Load Effect</b>	N5752A	– 5.26 mA _____ + 5.26 mA
	N5772A	– 5.5 mA _____ + 5.5 mA
<b>CC Source Effect</b>	N5752A	– 2.13 mA _____ + 2.13 mA
	N5772A	– 2.26 mA _____ + 2.26 mA

**WARNING**

Return the voltage and current settings to zero when verification is completed

Test Description	N5752A Setting	N5772A Setting
Voltage Programming & Readback, Min Voltage	1.5 V, 6.5 mA	1.5 V, 13 mA
Voltage Programming & Readback, High Voltage	600 V, 6.5 mA	600 V, 13 mA
CV Load Effect, Source Effect, Ripple and Noise	600 V, 1.3 A	600 V, 2.6 A
Transient Response	200 V, from 0.13 A to 1.17 A	200 V, from 0.26 A to 2.34 A
Current Programming & Readback, Min Current	6.5 mA, 600 V	13 mA, 600 V
Current Programming & Readback, High Current	1.3 A, 600 V	2.6 A, 600 V
CC Load Effect, Source Effect	1.3 A, 600 V	2.6 A, 600 V
Load Requirements	N5752A	N5772A
Current shunt	0.1Ω 15 A	0.1Ω 15 A
Use fixed resistor instead of load modules	462Ω 1kW	231Ω 2kW
Fixed Resistor for CV Ripple and Noise	462Ω 1kW	231Ω 2kW

## Calibration

Refer to the “Equipment Required” section in this appendix for a list of the equipment required for calibration. A general outline of the procedure is as follows:

- As shipped from the factory the calibration password is 0, which means password protection is removed and the ability to enter calibration mode is unrestricted. If a password has subsequently been set, you must enter the correct password – otherwise an error will occur. Once calibration has been entered, the password can be changed by the user.
- You do not have to do a complete calibration. If appropriate, you may calibrate only the voltage or current functions and then save the calibration constants. You can also save the date when the calibration was performed (see CAL:DATE <“date”>).
- As each calibration sequence is completed, the instrument saves the calibration constants and begins using them.
- Exit the calibration mode. Note that a Reset command (\*RST) also sets the calibration state to OFF.

### Calibration Procedure

**Unless instructed otherwise, connect the +sense terminal to the +output, and the -sense terminal to the -output.**

When calibrating the unit using SCPI commands, most calibration steps involve sending an \*OPC? query to synchronize with the power supply’s command completion before proceeding. The response from the instrument must be read each time \*OPC? is given.

#### NOTE

The CAL:LEV and CAL:DATA commands may take several seconds to complete. If a timeout occurs in your VISA application, you may need to change the VI\_ATTR\_TMO\_VALUE in the ViSetAttribute function.

---

### Voltage Programming and Measurement Calibration

**Step 1.** Connect the Keysight 3458A voltage input to the output.

**Step 2.** Enable voltage calibration mode.

```
*RST
OUTP ON
CAL:STAT ON
```

**Step 3.** Set the current limit high enough to allow unrestricted voltage programming.

```
ISET 0.5
```

**Step 4.** Select voltage calibration.

```
CAL:VOLT
```

**Step 5.** Select the first voltage calibration point.

```
CAL:LEV P1
*OPC?
```

**Step 6.** Measure the output voltage and enter the data.

```
CAL:DATA <data>
```

**Step 7.** Select the second voltage calibration point.

```
CAL:LEV P2
*OPC?
```

**Step 8.** Measure the output voltage and enter the data.

```
CAL:DATA <data>
```

**Step 9.** Exit calibration mode.

```
CAL:STAT OFF
```

### Current Programming and Measurement Calibration

**Step 1.** Connect a precision shunt resistor to an output. Connect the Keysight 3458A across the shunt. The shunt should be able to measure at least 120% of the power supply's rated full-scale current.

**Step 2.** Enable current calibration mode.

```
*RST
OUTP ON
CAL:STAT ON
```

**Step 3.** Set the output voltage high enough to compensate for any voltage drops on the load leads and current shunt.

```
VSET 0.5
```

**Step 4.** Select current calibration.

```
CAL:CURR
```

**Step 5.** Select the first current calibration point.

```
CAL:LEV P1
*OPC?
```

**Step 6.** Calculate the shunt current ( $I=V/R$ ) and enter the data.

```
CAL:DATA <data>
```

**Step 7.** Select the second current calibration point.

```
CAL:LEV P2
*OPC?
```

**Step 8.** Calculate the shunt current ( $I=V/R$ ) and enter the data.

```
CAL:DATA <data>
```

**Step 9.** Exit calibration mode.

```
CAL:STAT OFF
```

# Appendix C

## Service

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This chapter discusses the procedures involved for returning a failed instrument to Keysight Technologies for service or repair. A procedure is included for diagnosing specific symptoms. Actual repair is done through unit exchange.

## Types of Service Available

If your instrument fails during the warranty period, Keysight Technologies will replace or repair it free of charge. After your warranty expires, Keysight Technologies will replace or repair it at a competitive price.

Contact your nearest Keysight Technologies Service Center. They will arrange to have your instrument repaired or replaced.

## Repackaging for Shipment

If the unit is to be shipped to Keysight Technologies for service or repair, be sure to:

- Attach a tag to the unit identifying the owner and indicating the required service or repair. Include the model number and full serial number.
- Place the unit in its original container with appropriate packaging material for shipping.
- Secure the container with strong tape or metal bands.

If the original shipping container is not available, place your unit in a container that will ensure at least 4 inches of compressible packaging material around all sides for the instrument. Use static-free packaging materials to avoid additional damage to your unit.

*Keysight Technologies suggests that you always insure shipments.*

## Operating Checklist

If the power supply appears to be operating improperly, use the following procedures to determine whether the power supply, load, or external circuits are the cause.

### Turn-on check out procedure

Turn off the unit and remove all external connections to the instrument. Follow the turn-on checkout procedure in chapter 2.

### Trouble-shooting guide

If you have encountered problems during the checkout procedure, use the following guide to diagnose a specific symptom. If the action does not remedy the problem, return the unit for service.

Symptom	Check	Action
No output. All displays and indicators are blank.	Is the AC power cord defective?	Check continuity. Replace if necessary.
	Is the AC input voltage within range?	Check AC input voltage. Connect to appropriate voltage source.
Output is present momentarily, but shuts off quickly. Display indicates AC.	Does the AC source voltage sag when a load is applied?	Check AC input voltage. Connect to appropriate voltage source.
Output is present momentarily, but shuts off quickly. Display indicates OUP.	Is the power supply configured for remote sensing?	Check if the positive or negative load wire is loose.
Output voltage will not adjust. Front panel CC LED is on.	Is the power supply in constant current mode?	Check the current limit setting and load current.
Output voltage will not adjust. Front panel CV LED is on.	Is the output voltage being adjusted above the OVP setting or below the UVL setting?	Set the OVP or UVL so that they will not limit the output.
Output current will not adjust. Front panel CV LED is on.	Is the unit in constant voltage mode?	Check the current limit and voltage setting.
Large ripple present in output.	Is the power supply in remote sense?	Check load and sense wires connection for noise and impedance effects.
	Is the voltage drop on the load wire high?	Minimize the drop on the load wires.
No output. Display indicates OUP.	Over-voltage circuit has tripped.	Turn off the POWER switch. Check load connections. If analog programming is used, check if the OVP is set lower than the output.
No output. Front panel PROT indicator is blinking.	Display indicates EIIA?	Check connector J1 ENABLE connection. Also check SW1 switch setting.
	Display indicates SO?	Check connector J1 Output Shut-Off connection.
	Display indicates O7P?	Check if air intake or exhaust is blocked. Check if unit is installed next to heat-generating equipment.
	Display indicates OCP?	Check OCP setting and load current.
Poor load regulation. Front panel CV LED is on.	Are sense wires properly connected?	Connect sense wires according to instructions in chapter 2.
Front panel controls are nonfunctional.	Is the power supply in Local Lockout mode?	Turn off the POWER switch and wait until the display turns off. Turn on the POWER switch and press the REM/LOC button.

## Error Messages

### Displaying the SCPI error queue

The entire error queue is read, then emptied, using the following command: SYST:ERR?

### Error List

The following table documents the various error messages that the power supply supports:

Error	Device-dependent Errors (these errors set Standard Event Status register bit #3)
0	<b>No error</b> This is the response to the ERR? query when there are no errors.
100	<b>Too many channels</b> You have specified more channels than are installed in the mainframe.
101	<b>Calibration state is off</b> Calibration is not enabled. The instrument will not accept calibration commands.
102	<b>Calibration password is incorrect</b> The calibration password is incorrect.
104	<b>Bad sequence of calibration commands</b> Calibration commands have not been entered in the proper sequence.
114	<b>CAL:DATE must be yyyy/mm/dd</b> The calibration date must be entered in the numeric format yyyy=year, mm=month, dd=date
203	<b>Compatibility function not implemented</b> The requested compatibility function is not available.
204	<b>NVRAM checksum error</b> A checksum error has occurred in the instrument's nonvolatile random access memory.
205	<b>NVRAM full</b> The nonvolatile random access memory of the instrument is full.
206	<b>File not found</b> The internal calibration file or the internal channel attribute file was not found in NVRAM.
209	<b>Output communications failure</b> A hardware failure has occurred on the power supply.
302	<b>Option not installed</b> The option that is programmed by this command is not installed.
351	<b>VOLT setting conflicts with VOLT:PROT setting</b> Attempted to program the voltage above the over-voltage protection setting.
352	<b>VOLT:PROT setting conflicts with VOLT setting</b> Attempted to set the over-voltage protection below the voltage setting.
353	<b>VOLT setting conflicts with VOLT:LIM:LOW setting</b> Attempted to program the voltage below the under-voltage limit setting.
354	<b>VOLT:LIM:LOW setting conflicts with VOLT setting</b> Attempted to set the under-voltage limit above the voltage setting



---

<b>Command Errors</b> (these errors set Standard Event Status register bit #5)	
-100	<b>Command error</b> Generic syntax error.
-101	<b>Invalid character</b> An invalid character was found in the command string.
-102	<b>Syntax error</b> Invalid syntax was found in the command string. Check for blank spaces.
-103	<b>Invalid separator</b> An invalid separator was found in the command string. Check for proper use of , ; :
-104	<b>Data type error</b> A different data type than the one allowed was found in the command string.
-105	<b>GET not allowed</b> A group execute trigger is not allowed in a command string.
-108	<b>Parameter not allowed</b> More parameters were received than were expected.
-109	<b>Missing parameter</b> Fewer parameters were received than were expected.
-110	<b>Command header error</b> An error was detected in the header.
-111	<b>Header separator error</b> A character that was not a valid header separator was found in the command string.
-112	<b>Program mnemonic too long</b> The header contains more than 12 characters.
-113	<b>Undefined header</b> A command was received that was not valid for this instrument.
-114	<b>Header suffix out of range</b> The value of the numeric suffix is not valid.
-120	<b>Numeric data error</b> Generic numeric data error.
-121	<b>Invalid character in number</b> An invalid character for the data type was found in the command string.
-123	<b>Exponent too large</b> The magnitude of the exponent was larger than 32000.
-124	<b>Too many digits</b> The mantissa of a numeric parameter contained more than 255 digits, excluding leading zeros.
-128	<b>Numeric data not allowed</b> A numeric parameter was received but a character string was expected.
-130	<b>Suffix error</b> Generic suffix error
-131	<b>Invalid suffix</b> A suffix was incorrectly specified for a numeric parameter.
-134	<b>Suffix too long</b> The suffix contains more than 12 characters.
-138	<b>Suffix not allowed</b> A suffix is not supported for this command.
-140	<b>Character data error</b> Generic character data error

---

<b>Command Errors (continued)</b>	
-141	<b>Invalid character data</b> Either the character data element contains an invalid character, or the element is not valid.
-144	<b>Character data too long</b> The character data element contains more than 12 characters.
-148	<b>Character data not allowed</b> A discrete parameter was received, but a string or numeric parameter was expected.
-150	<b>String data error</b> Generic string data error
-151	<b>Invalid string data</b> An invalid character string was received. Check that the string is enclosed in quotation marks.
-158	<b>String data not allowed</b> A character string was received, but is not allowed for this command.
-160	<b>Block data error</b> Generic block data error
-161	<b>Invalid block data</b> The number of data bytes sent does not match the number of bytes specified in the header.
-168	<b>Block data not allowed</b> Data was sent in arbitrary block format but is not allowed for this command.
-170	<b>Expression error</b> Generic expression error
-171	<b>Invalid expression data</b> The expression data element was invalid.
-178	<b>Expression data not allowed</b> Expression data element was sent but is not allowed for this command.
<b>Execution Errors (these errors set Standard Event Status register bit #4)</b>	
-200	<b>Execution error</b> Generic syntax error
-220	<b>Parameter error</b> A data element related error occurred.
-221	<b>Settings conflict</b> A data element could not be executed because of the present instrument state.
-222	<b>Data out of range</b> A data element could not be executed because the value was outside the valid range.
-223	<b>Too much data</b> A data element was received that contains more data than the instrument can handle.
-224	<b>Illegal parameter value</b> An exact value was expected but not received.
-225	<b>Out of memory</b> The device has insufficient memory to perform the requested operation.
-226	<b>Lists not same length</b> One or more lists are not the same length.
-230	<b>Data corrupt or stale</b> Possible invalid data. A new reading was started but not completed.

---

<b>Execution Errors (continued)</b>	
-231	<b>Data questionable</b> The measurement accuracy is suspect.
-232	<b>Invalid format</b> The data format or structure is inappropriate.
-233	<b>Invalid version</b> The version of the data format is incorrect to the instrument.
-240	<b>Hardware error</b> The command could not be executed because of a hardware problem with the instrument.
-241	<b>Hardware missing</b> The command could not be executed because of missing hardware, such as an option.
-260	<b>Expression error</b> An expression program data element related error occurred.
-261	<b>Math error in expression</b> An expression program data element could not be executed due to a math error.

---

<b>Query Errors (these errors set Standard Event Status register bit #2)</b>	
-400	<b>Query Error</b> Generic error query
-410	<b>Query INTERRUPTED</b> A condition causing an interrupted query error occurred.
-420	<b>Query UNTERMINATED</b> A condition causing an unterminated query error occurred.
-430	<b>Query DEADLOCKED</b> A condition causing a deadlocked query error occurred.
-440	<b>Query UNTERMINATED after indefinite response</b> A query was received in the same program message after a query indicating an indefinite response was executed.

---



# Appendix D

## Compatibility

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The Keysight N5700 power supplies are programmatically compatible with the Keysight 603xA power supplies. This means that you can remotely program the Keysight N5700 power supplies using the same commands that are used to program the 603xA power supplies.

**CAUTION**

Do not mix Compatibility with SCPI commands in the same program. This will result in unpredictable instrument behavior.

---

## Differences – In General

The following table documents the general differences between the way Compatibility commands work on the Keysight N5700 power supplies and the way they worked on the Keysight 603xA power supplies.

Item	Differences
<b>Queries</b>	<p>The Keysight N5700 will respond to multiple queries.</p> <p>It will not allow a space separator between numbers.</p> <p>It will not allow a user to query information, read back only a portion of the information, send another command, and finish reading back the information from the original query.</p> <p>Sending a second query without reading the response to the first will generate an error.</p> <p>Model number queries will only return the N5700 model numbers.</p>
<b>Status functions</b>	<p>Serial Poll will be controlled by the SCPI status model and will not act like a 603xA power supply.</p> <p>SRQ will be controlled by the SCPI status model.</p> <p>Parallel poll will not work.</p>
<b>Settings</b>	<p>The full-scale limits will match the Keysight N5700 limits.</p>
<b>Measurement</b>	<p>Floating point numbers returned by the instrument may not have exactly the same syntax or number of digits.</p>
<b>Calibration</b>	<p>Calibration must be done in SCPI.</p>
<b>Storage states</b>	<p>The Keysight N5700 units have 16 volatile states.</p>

## Compatibility Command Summary

The following table documents the compatibility commands that the Keysight N5700 power supplies support. All compatibility commands are accepted; however, some commands do nothing.

Compatibility Command	Description	Similar SCPI Command
ASTS?	Queries the accumulated status (ASTS). The response represents the sum of the binary weights of the ASTS register bits. The ASTS register is set to the present status after being queried.	STAT:OPER:EVENT? STAT:QUES:EVENT? *ESE?
CLR	Returns the power supply to the power-on state. Same as *RST.	*RST
DLY <delay>	Generates error 203.	
DLY?	Generates error 203.	
ERR?	Queries the present programming or hardware error. An error code number is returned over the GPIB to identify the error. The error register is cleared after being read.	SYST:ERR?
FAULT?	Queries the fault register. A bit is set in the fault register when the corresponding bit in both the status and the mask registers. The response is an integer 0 to 255. The fault register is cleared after being read.	STAT:OPER? STAT:QUES? *ESE?
FOLD	Turns the OCP on or off. This is only allowed for constant current mode (FOLD 2). Constant voltage mode (FOLD1) generates error 203.	CURR:PROT:STAT
FOLD?	Queries the OCP setting. The response is FOLD 2.	CURR:PROT:STAT?
HOLD	When turned on (HOLD 1), causes the VSET, ISET, FOLD, and UNMASK values to be held until a trigger occurs. This only applies to the compatibility functions, not the SCPI functions	VOLT:TRIG CURR:TRIG
HOLD?	Queries the hold setting. The response is HOLD 1.	
ID?	Queries the identification (model number) of the power supply.	*IDN?
IMAX	Sets a soft programming limit for current. Attempting to program the current above this setting will generate an error.	
IMAX?	Queries the IMAX setting. The response is a real number.	
IOUT?	Queries the measured output current. The response is a real number.	MEAS:CURR?
ISET <current>	Sets the output current.	CURR
ISET?	Queries the present current setting. The response is a real number.	CURR?
OUT <on off>	Turns the output on or off. On/off equals 1 turns the output on; equals 0 turns the output off.	OUTP:STAT
OUT?	Queries whether the output is turned on or off. The response is OUT 1 (on) or OUT 0 (off). The front panel displays OFF when the output is off.	OUTP:STAT?

Compatibility Command	Description	Similar SCPI Command
OVP	Sets the over-voltage trip point.	VOLT:PROT:LEV
OVP?	Queries the present over-voltage setting. The response is a real number.	VOLT:PROT:LEV?
RCL <reg>	Recalls the saved settings. There are up to 16 store/recall states. Saved settings must have been previously stored using the STO command.	*RCL
ROM?	Queries the revision date of the power supply's firmware.	*IDN?
RST	Resets any tripped protection.	OUTP:PROT:CLE
SRQ <setting>	Generates error 203. The service request capability of the power supply is only supported using the SCPI commands	*SRQ
SRQ?	Always returns 0.	*SRQ?
STO <reg>	Stores the present power supply settings in the specified register. There are up to 16 store/recall states.	*SAV
STS?	Queries the present status. The response represents the sum of the binary weights of the status register bits. The response is STS <n>	STAT:OPER:COND? STAT:QUES:COND?
TEST?	Always returns 0.	*TST?
TRG	Causes the settings held with HOLD 1 to be executed.	
UNMASK <setting>	Sets the bits in the mask register to the setting. The setting is an integer that represents the sum of the binary weights of the bits. The mask register operates in conjunction with the status and fault registers.	STAT:OPER:NTR STAT:OPER:PTR STAT:QUES:NTR STAT:QUES:PTR
UNMASK?	Queries the present setting of the mask register. The response is UNMASK <n>.	STAT:OPER:NTR? STAT:OPER:PTR? STAT:QUES:NTR? STAT:QUES:PTR?
VMAX	Sets the soft programming limit for voltage. Attempting to program the voltage above this setting will generate an error.	
VMAX?	Queries the VMAX setting. The response is VMAX <n>.	
VOUT?	Queries the measured output voltage. The response is a real number.	MEAS:VOLT?
VSET <voltage>	Sets the output voltage.	VOLT
VSET?	Queries the present voltage setting. The response is a real number.	VOLT?



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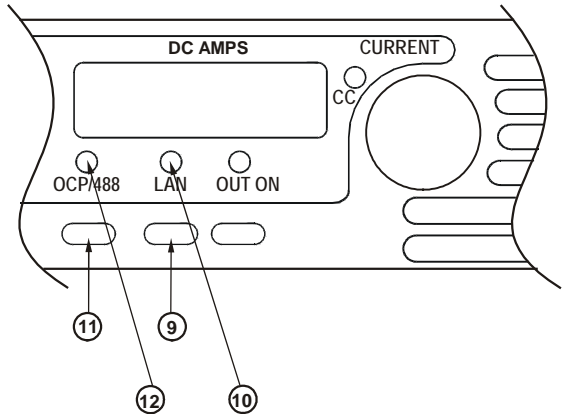
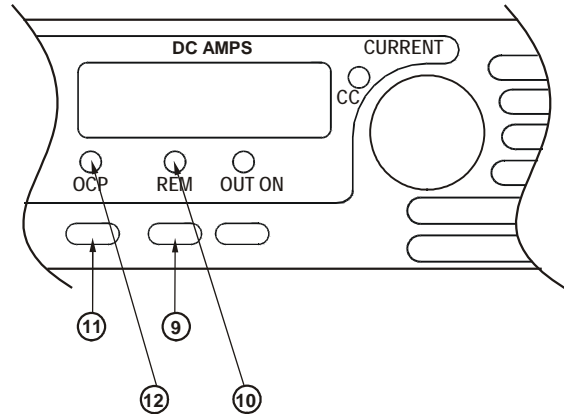
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# Manual Backdating

The following documents the differences between front panel operation of the LXI-compliant units and the pre-LXI units.

LXI-compliant units (see page 10 for additional details)	Pre-LXI units
	
<p><b>9 – LAN button</b></p>	<p><b>9 – REM button</b></p>
<p><u>View address:</u> Press LAN to view the IP and Ethernet address.  <u>Reset address:</u> Press and hold the LAN button for three seconds. Pressing the LAN button again while “LAN rES” is displayed resets the LAN configuration to the factory-shipped settings.</p>	<p><u>Mode function:</u> Press REM to put the unit into local mode. This function is not available in LXI compliant units.  <u>Address function:</u> Selects the GPIB address. Press and hold the REM button for three seconds to set the address with the Voltage knob.</p>
<p><b>10 – LAN indicator</b></p>	<p><b>10 – REM indicator</b></p>
<p>When lit, indicates that the LAN has been configured and is operating normally. When blinking, identifies the unit for which the indicator has been set to blink by the unit’s Web home page.</p>	<p>When lit, indicates that the unit is in Remote mode. This function is not available in LXI compliant units.</p>
<p><b>11 – OCP/488 button</b></p>	<p><b>11 – OCP button</b></p>
<p><u>Enable OCP:</u> Press OCP/488 to turn over-current protection (OCP) on. Press again to turn OCP off.  <u>Reset OCP:</u> When an over-current protection event occurs, press the OUT ON button to enable the output and re-arm over-current protection.  <u>GPIB address:</u> Press and hold the OCP/488 button for three seconds to set the address with the Voltage knob.</p>	<p><u>Enable function:</u> Press OCP to turn over-current protection (OCP) on. Press again to turn OCP off.  <u>Reset OCP:</u> When an over-current protection event occurs, press the OUT ON button to enable the output and re-arm over-current protection.</p>
<p><b>12 – OCP indicator</b></p>	<p><b>12 – OCP indicator</b></p>
<p>When lit, indicates that over-current protection is enabled or on.</p>	<p>When lit, indicates that over-current protection is enabled or on.</p>



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[www.keysight.com](http://www.keysight.com)

Keysight Technologies

系统直流电源

N5700 系列

快速参考指南





## 安全注意事项

在操作本仪器的所有阶段，必须遵守下列一般性安全预防措施。不遵守这些预防措施或本手册中的其他特定警告或说明，将违反该仪器的设计、制造和使用的安全标准。是德科技公司对客户不遵守这些规定而导致的后果不承担任何责任。

### 一般原则

不要以制造商规定之外的方式使用本产品。如不按照操作手册中规定的方式使用本产品，其保护功能可能会失效。

### 接通电源前

检查是否已采取所有安全预防措施。在接通电源前，确保进行了设备的所有连接。请留意在“安全符号”下面介绍的仪器外部标识。

### 将仪器接地

本产品为 1 类安全仪器（提供了保护接地端子）。要将电击危险降到最低程度，必须将仪器机箱和机盖接地。必须通过接地电源线将仪器连接到交流电源，接地电线要牢固地连接到电源插座的电气接地（安全接地）端。中断保护（接地）导线或断开保护接地端子，将产生可导致人身伤害的潜在电击危险。

### 熔断器

本仪器包含一个用户无法接触到的内部熔断器。

### 不要在易爆环境中操作

不要在有易燃性气体或烟雾的场所使用本仪器。

### 不要卸下仪器机盖

只能由合格的、经过维修培训且了解潜在危险的专业人员打开仪器机盖。在卸下仪器机盖之前，要断开电源线和外部电路。

### 不要改动仪器

不要安装代用零件或对产品擅自改动。请将仪器返回是德销售和服务部进行维护和维修，以保持其安全特性。

### 发生损坏时

仪器一旦出现损坏或故障迹象，应停止操作并防止无意操作，并等待合格的维修人员进行修理。

#### 小心

小心符号表示存在危险。它提请用户对某一操作过程、操作方法或类似情况的注意。如果不能正确执行或遵守规则，则可能对产品造成损坏或丢失重要数据。在完全理解和满足所指出的小心条件之前，不要继续下一步。

#### 警告

警告符号表示存在危险。它提请用户对某一操作过程、操作方法或类似情况的注意。如果不能正确执行或遵守规则，则可能造成人身伤害或死亡。在完全理解和满足所指出的警告条件之前，不要继续下一步。

### 安全符号

	直流电
	交流电
	直流和交流电
	三相交流电
	接地端子
	保护接地端子
	框架或机箱端子
	端子处于地电位
	永久安装设备上的中性导线
	永久安装设备上的线路导线
	开启电源
	关闭电源
	待机电源。当开关关闭时，设备并未与交流电源完全断开。
	双稳态按钮开关的推入位置
	双稳态按钮开关的弹出位置
	小心，有电击危险
	小心，表面高温
	小心，参见随附的文档
	请勿作为生活废弃物丢弃。

# 法律通告

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## Keysight N5700 直流电源概览

Keysight Technologies N5700 系列系统直流电源是一种通用开关电源，它具有多种输出电压和电流额定值。

这些电源已经过功率因数校正，可在世界各地的交流电压下工作。输出电压和电流将始终显示，LED 指示灯将显示出电源的完整工作状态。

用户可使用前面板控制钮来设置输出参数、过电压、欠电压和过电流保护电平，并可对设置进行预览。

后面板具有必要的连接器，它们通过模拟信号或内置远程通信接口来控制 and 监视电源工作。

### 输出功能

- 恒压/恒流自动转换。
- 高分辨率电压和电流前面板控制钮。
- 精确的电压和电流读数。
- 独立的边沿触发外部关断，以及电平触发外部启用/禁用。
- 可共享有效电流的并联主/从操作。
- 远程感测以补偿负载导线中的电压降。
- 模拟输出编程和监视。

### 系统特性

- 内置 GBIB/LAN/USB 接口。
- 可从计算机上的因特网浏览器直接控制仪器的内置 Web 服务器。
- 零间隙叠放 – 在电源的顶部和底部表面没有通风孔。
- 带有效功率因数校正的通用输入电压。
- 风扇转速控制可降低噪音并延长风扇寿命。

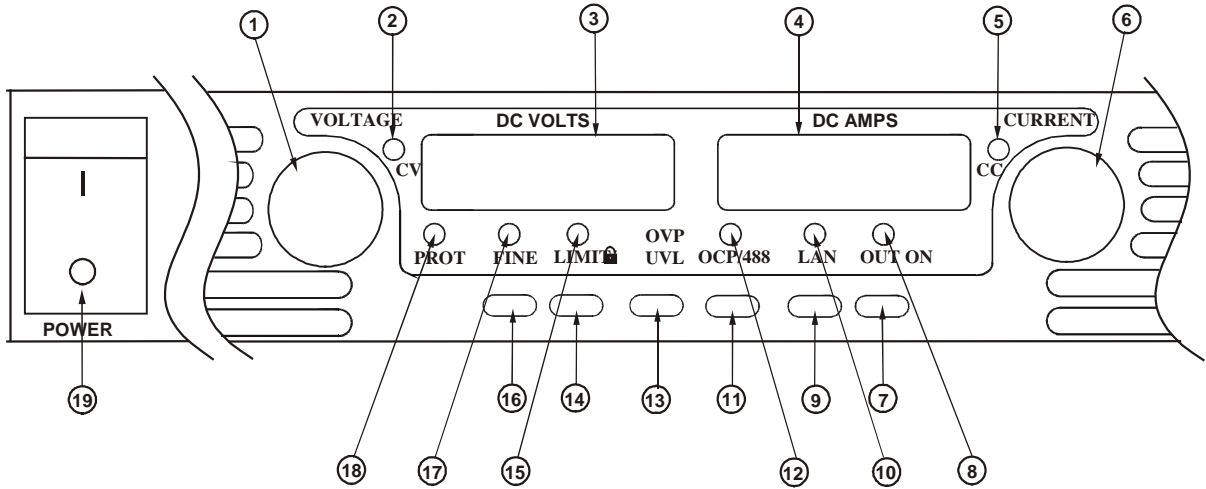
## 可编程功能

- 输出电压和电流设置。
- 输出电压和电流测量。
- 输出电压和电流触发设置。
- 输出开/关控制。
- 过电流保护设置。
- 过电压保护设置和读数。
- 欠电压限值设置和读数。
- 启动模式 ( 上一次设置模式或复位模式 )
- 状态寄存器设置和读数。
- 总线触发
- 校准

## 各种型号的额定值

型号	电压 范围	电流 范围	型号	电压 范围	电流 范围
N5741A	0 – 6V	0 – 100A	N5761A	0 – 6V	0 – 180A
N5742A	0 – 8V	0 – 90A	N5762A	0 – 8V	0 – 165A
N5743A	0 – 12.5V	0 – 60A	N5763A	0 – 12.5V	0 – 120A
N5744A	0 – 20V	0 – 38A	N5764A	0 – 20V	0 – 76A
N5745A	0 – 30V	0 – 25A	N5765A	0 – 30V	0 – 50A
N5746A	0 – 40V	0 – 19A	N5766A	0 – 40V	0 – 38A
N5747A	0 – 60V	0 – 12.5A	N5767A	0 – 60V	0 – 25A
N5748A	0 – 80V	0 – 9.5A	N5768A	0 – 80V	0 – 19A
N5749A	0 – 100V	0 – 7.5A	N5769A	0 – 100V	0 – 15A
N5750A	0 – 150V	0 – 5A	N5770A	0 – 150V	0 – 10A
N5751A	0 – 300V	0 – 2.5A	N5771A	0 – 300V	0 – 5A
N5752A	0 – 600V	0 – 1.3A	N5772A	0 – 600V	0 – 2.5A

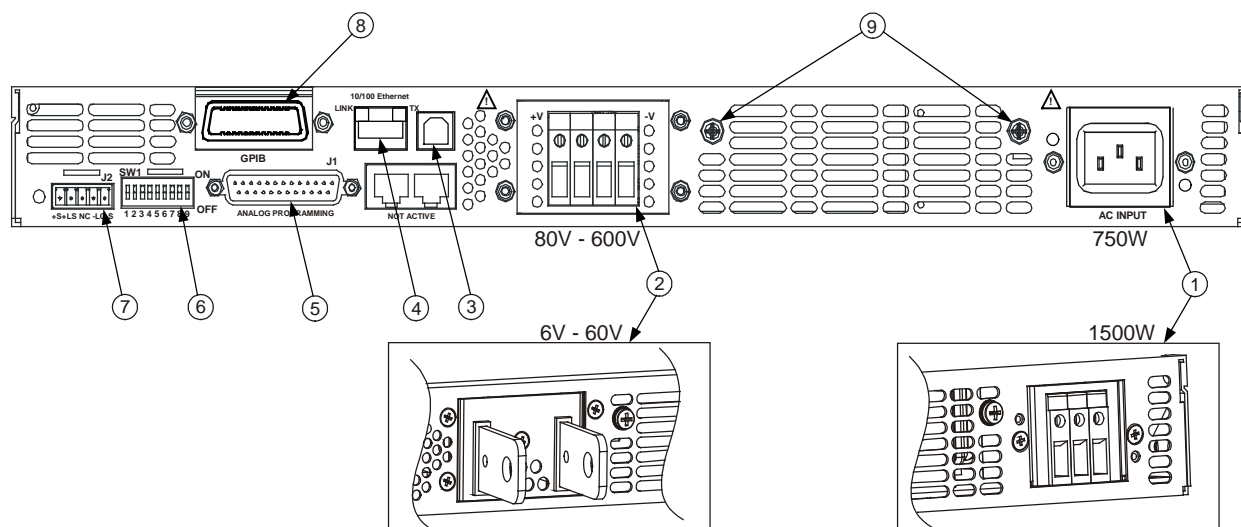
## 前面板概览



- 1 – VOLTAGE (电压) 旋钮** 电压功能：调节输出电压、过电压保护电平和欠电压限值。如果已经设置过电压保护或欠电压限值，您就不能将输出电压设定在这些限值之外。  
GPIO 地址：按住 OCP/488 时，可选择 GPIO 地址。
- 2 – CV (恒压) 指示灯** 亮起时，表示设备正在恒压模式下工作 - 输出电压保持恒定。
- 3 – DC VOLTS (直流电压) 显示屏** LED 显示屏，通常显示在感测端子上测得的电压。按下 LIMIT 时，该显示屏将显示已设定的电压设置。按住 OVP/UVL 时，该显示屏将显示 OVP 或 UVL 设置。按住 OCP/488 时，该显示屏将显示 GPIO 地址。按住 LAN 时，该显示屏将显示 IP 和以太网地址。
- 4 – DC AMPS (直流电流) 显示屏** LED 显示屏，通常显示在输出端子处测得的电流。按下 LIMIT 时，该显示屏将显示已设定的电流设置。按住 LAN 时，该显示屏将显示 IP 和以太网地址。
- 5 – CC (恒流) 指示灯** 亮起时，表示设备正在恒流模式下工作 - 输出电流保持恒定。
- 6 – CURRENT (电流) 旋钮** 调节输出电流。
- 7 – OUT ON (开启输出) 按钮** 输出功能：按 OUT ON 可开启或关闭输出。在发生 OVP 或 OCP 事件后，按 OUT ON 可复位和开启输出。  
启动功能：在安全启动模式和自动重启模式之间选择。按住 OUT ON 按钮可在安全启动和自动重启之间进行切换。显示将在 SAF 和 AUT 之间循环。在显示其中一个模式时，松开 OUT ON 按钮以选择该模式。
- 8 – OUT ON (开启输出) 指示灯** 亮起时，表示已启用或开启输出。

- 9 – LAN 按钮**      查看地址：按 LAN 可查看 IP 和以太网地址。显示屏上先滚动显示四个 IP 地址段，然后显示六个以太网 (EA) 地址段。按任何键可关闭地址显示。
- 复位地址：按住 LAN 按钮三秒钟。当出现消息“LAN rES”时再次按下 LAN 按钮可将 LAN 配置复位为出厂默认设置。有关设置信息，请参见《用户指南》。
- 10 – LAN 指示灯**      如果亮起，表示 LAN 已被配置并正常工作。如果闪烁，则指示通过设备的 Web 主页将其指示灯设置为闪烁的设备。
- 11 – OCP/488 (过电流保护) 按钮**      启用功能：按 OCP/488 可开启过电流保护功能。再次按 OCP/488 可关闭过电流保护功能。
- 复位 OCP：当发生过电流保护事件时，按 OUT ON 按钮可启用输出并使过电流保护重新处于待命状态。
- GPIB 地址：按住 OCP/488 按钮三秒钟。这样您就可以使用电压旋钮设置 GPIB 地址。
- 12 – OCP (过电流保护) 指示灯**      亮起时，表示已启用或开启过电流保护功能。
- 13 – OVP/UVL (过电压保护/欠电压限值) 按钮**      OVP 功能：按 OVP/UVL 一次可使用电压旋钮设置过电压保护电平 ( 屏幕上显示 OUP )。您不能将过电压保护设置为当前输出电压设置以上低于大约 5% 的值。
- UVL 功能：按 OVP/UVL 两次可使用电压旋钮设置欠电压编程限值 ( 屏幕上显示 UUL )。您不能将欠电压保护设置为当前输出电压设置以下高于大约 5% 的值。
- 14 – LIMIT (限值) 按钮**      限值功能：按 LIMIT 可显示输出电压和电流限值。显示屏将显示设置五秒钟，然后返回以显示实际输出电压和电流。
- 锁定功能：按住 LIMIT 按钮可在“锁定”前面板和“未锁定”前面板之间切换。显示将在 LFP 和 UFP 之间循环。在显示其中一个模式时，松开 LIMIT 按钮以选择该模式。如果显示屏上显示 rLFP，则表明前面板已被远程编程命令锁定。
- 15 – LIMIT (限值) 指示灯**      亮起时，表示已按下 LIMIT 按钮。
- 16 – FINE (微调) 按钮**      选择“微调”或“粗调”控制。在微调模式下，电压和电流旋钮的操作具有高分辨率；在粗调模式下，分辨率较低 ( 大约六转 )。
- 17 – FINE (微调) 指示灯**      亮起时，表示设备处于微调模式。
- 18 – PROT (保护) 指示灯**      当它闪烁时，表示发生了故障。
- OVP、OCP、OTP、启用失败以及交流故障都将导致 PROT 指示灯闪烁。设备关闭后，PROT 指示灯可能闪烁，屏幕上显示 AC 几秒钟，这是由于设备中存有剩余电量。
- 19 – POWER (电源) 开关**      开启或关闭电源。

## 后面板概览



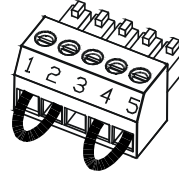
- |              |   |
|--------------|---|
| 1 – 交流输入连接器  | 1500W 输出型号的线夹连接器。<br>750W 输出型号的 IEC 连接器。  |
| 2 – 直流输出连接器  | 80V 至 600V 型号的线夹连接器。<br>6V 至 60V 型号的母线。   |
| 3 – USB 连接器  | 连接 USB 接口的连接器。  |
| 4 – LAN 连接器  | 连接 LAN 接口的连接器。LINK LED 可指示出链路完整性。TX LED 可指示出 LAN 活动状态。请参见《用户指南》以了解 LAN 设置。  |
| 5 – 模拟编程连接器  | 用于模拟接口的连接器。包括输出电压和电流限值编程和监视信号、关断控制 ( 电子信号 )、启用/禁用控制 ( 干触点 )、电源正常 (Power Supply OK) 信号和工作模式 (CV/CC) 信号。( 请参见下一页以了解详细信息 ) |
| 6 – SW1 设置开关 | 共有九个开关位置，用于为输出电压、电流限值和其他控制功能选择远程编程和监视模式。( 请参见下一页以了解详细信息 )   |
| 7 – 远程感测连接器  | 进行远程感测连接以调节负载电压及补偿导线电压降的连接器。( 请参见下一页以了解详细信息 )   |
| 8 – GPIB 连接器 | 连接 GPIB 接口的连接器。   |
| 9 – 接地螺钉     | 用于进行机箱接地连接的 M4x8 螺钉。  |

### 警告

**电击危险** 电源线通过第三根导线提供机箱接地。确保使用三相电源插座，并且接地插脚连接正确。

## J2 感测连接器

- 1 – 远程感测 (+)
- 2 – 本地感测 (+)
- 3 – 未使用
- 4 – 本地感测 (-)
- 5 – 远程感测 (-)



- 插头型号： MC 1.5/5-ST-3.81 , Phoenix
- 导线规格： 28 AWG 到 16 AWG
- 剥皮长度： 7 mm (0.28 in.)
- 扭矩： 0.22 – 0.25 Nm (1.95 – 2.21 in-lb.)

出厂配置如下图所示。

## SW1 设置开关

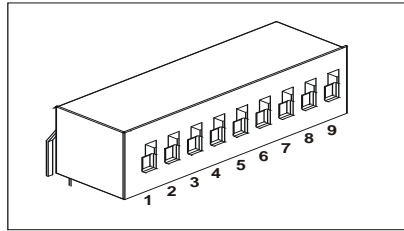


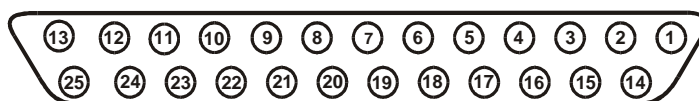
Fig.4-3: SW1 setup DIP switch

出厂时，所有开关都设置为“下”位置。

- |                     |   |
|---------------------|---|
| 1 – 输出电压，电压编程       | <p><u>下</u>：通过前面板对输出电压进行设定。</p> <p><u>上</u>：通过外部电压信号对输出电压进行设定。</p>  |
| 2 – 输出电流，电压编程       | <p><u>下</u>：通过前面板对输出电流进行设定。</p> <p><u>上</u>：通过外部电压信号对输出电流进行设定。</p>  |
| 3 – 编程范围<br>(电压/电阻) | <p><u>下</u>：远程编程范围：0 – 5V / 0 – 5KΩ。</p> <p><u>上</u>：远程编程范围：0 – 10V / 0 – 10KΩ。</p>   |
| 4 – 电压和电流监视范围       | <p><u>下</u>：远程监视范围：0 – 5V。</p> <p><u>上</u>：远程编程范围：0 – 10V。</p>  |
| 5 – 关断逻辑选择          | <p><u>下</u>：OUT OFF = 低 (0 – 0.6V) 或短接； OUT ON = 高 (2V – 15V) 或断开。</p> <p><u>上</u>：OUT OFF = 高 (2V – 15V) 或断开； OUT ON = 低 (0 – 0.6V) 或短接。</p> |
| 6 – 未使用             |   |
| 7 – 输出电压，电阻编程       | <p><u>下</u>：通过前面板对输出电压进行设定。</p> <p><u>上</u>：通过外部电阻对输出电压进行设定。</p>  |
| 8 – 输出电流，电阻编程       | <p><u>下</u>：通过前面板对输出电流进行设定。</p> <p><u>上</u>：通过外部电阻对输出电流进行设定。</p>  |
| 9 – 启用/禁用控制         | <p><u>下</u>：J1 启用+/启用- 针不起作用。</p> <p><u>上</u>：J1 启用+/启用- 针起作用。</p>  |



## J1 模拟编程连接器



配接插头： AMP 部件号 745211-2  
导线规格： 26 AWG 到 22 AWG  
拉拔工具： AMP 部件号 91232-1 或等同

出厂默认配置为“本地”操作，无需连接到 J1。

针 1：	启用在	将针 1 连接到针 14 可启用输出。断开连接可禁用输出。
针 2、3：	机箱共用	用于针 15 和针 16 的信号共用回路。连接到机箱。
针 4-7：	未使用	无连接
针 8：	本地/模拟	用于在输出的前面板编程或模拟编程之间进行选择的输入。
针 9：	电压编程	用于输出电压的电压或电阻编程的输入。
针 10：	电流编程	用于输出电流的电压或电阻编程的输入。
针 11：	电压监视	用于监视输出电压的输出。
针 12：	共用	用于针 8、针 11、针 13 和针 24 的信号共用回路。从内部连接到 -S。
针 13：	恒压/恒流	用于恒压/恒流模式指示的输出。
针 14：	启用出	将针 14 连接到针 1 可启用输出。断开连接可禁用输出。
针 15：	关断	用于输出的关断控制的输入。连接到“机箱共用”端。
针 16：	电源正常	用于指示电源状态的输出。连接到“机箱共用”端。
针 17-20：	未使用	无连接
针 21：	本地/模拟状态	用于指示本地或模拟编程模式的输出。
针 22：	电压编程回路	用于针 9 的信号回路。从内部连接到 -S。
针 23：	电流编程回路	用于针 10 的信号回路。从内部连接到 -S。
针 24：	电流监视	用于监视输出电流的输出。
针 25：	并联	用于并联操作中电流平衡的输出。

# 安装设备

## 安全注意事项

本电源为 1 类安全仪器，这意味着它有一个保护接地端子。该端子必须通过配备接地插座的电源接地。请参阅本指南开头的“安全注意事项”页以了解一般安全信息。

## 工作环境

### 警告

请不要在有易燃气体和烟雾的场所操作本仪器。

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### 小心

不要挡住仪器前面的进气口或设备后面的排气口。

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只应在可控制的室内环境中操作本仪器。不要在环境温度超过 40° C 的区域中操作电源。

风扇通过从前面抽取空气并从后面排出来给电源降温。仪器必须安装在其前、后至少有 10 cm (4 in) 空间的位置，以保证足够的空气流通。

## 机架安装

Keysight N5700 电源可以安装在标准 19 in. 机架或机柜中。在机架中安装电源：

1. 使用前面板机架安装托架在机架中安装电源。
2. 使用支撑架为电源的后面提供足够的支撑。
3. 如果使用机架安装滑轨，请使用 Keysight N5740A 机架安装滑轨套件以将仪器安装在标准 19 in. 设备机架中。在每侧使用两个 #10-32 x 3/8 in. (最大) 螺钉。要防止发生内部损坏，请仅使用规定长度的螺钉。

## 清洁

### 警告

**电击危险** 要防止受到电击，请在清洁前拔下仪器的电源插头。

---

使用一块干布或用水略微蘸湿的布来清洁机箱外部部件。请勿尝试清洁内部。

## 连接电源线

### 警告

**电击危险** 电源线通过第三根导线提供机箱接地。确保电源插座为三相插座，接地插脚连接正确。

**火灾危险** 请仅使用仪器随附的电源线。使用其他类型的电源线可能引起电源线过热，从而导致火灾。

### 注意

可拆卸电源线可当作一种紧急断电装置来使用。拔下电源线将断开设备的交流输入电源。

设备后面的交流输入为一个通用交流输入。它可接受 85 VAC 到 265 VAC 范围内的线电压。频率范围为 47 Hz 到 63 Hz。

750W 设备的输入电流要求为 10.5A (在 100 VAC 标称值下) 和 5A (在 200 VAC 标称值下)。1500 W 设备的电流要求为 21A (在 100 VAC 标称值下) 和 11A (在 200 VAC 标称值下)。

## 750W 设备的输入连接

将电源线连接到设备后面的 IEC 320 接口。当交流电源线插入接地的交流插座中时，IEC 接口可提供安全接地连接。

如果设备随附的电源线不正确，请与最近的是德销售和服务机构联系。

## 1500W 设备的输入连接

### 小心

此电源到交流电源的连接应由合格的电工或其他合格的人员来完成。

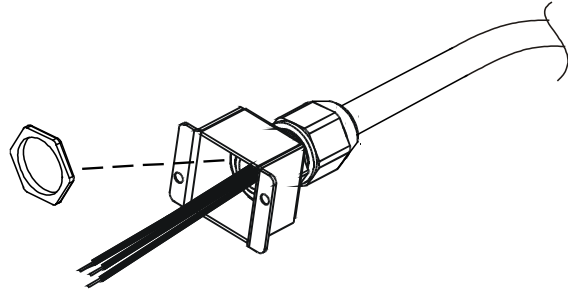
交流输入连接器是位于后面板上的三端子线夹。请使用正确的导线并施加适当的紧固扭矩。

导线规格： 12 AWG 或 10 AWG

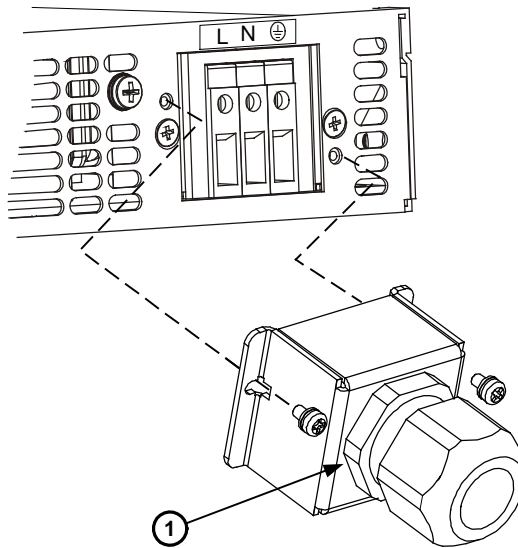
扭矩： 6.5 – 7.0 in-lb.

如下所述，将电缆连接到交流输入连接器：

- 剥去大约 10 cm (4 in) 的交流电缆外部绝缘层。修剪导线，使接地线比其他导线长 10 mm (0.4 in)。在每根导线的末端剥去 14 mm (0.55 in) 长的外皮。
- 从压紧螺母上拧下电缆护套底座。将防松螺母放入交流输入盖板的内侧。通过交流输入盖板的外部开口插入电缆护套底座，将底座拧紧到防松螺母上。



- 将压紧螺母滑到交流电缆上。将已剥皮导线穿过电缆护套底座，直到外面的电缆护层与电缆护套底座平齐。用扳手夹住底座，以防止其转动。保持电缆正确定位的同时将压紧螺母拧紧到底座上。
- 根据需要将交流导线接到输入连接器端子上。要连接导线，请将端子螺钉拧松，将已剥皮导线插入端子，然后拧紧螺钉。
- 在盖板内布置导线，使其免受挤压。使用随附的 M3 x 8mm 平头螺钉将盖板固定到设备上。请参考下图。



1 – 组装好的电缆护套

## 连接负载 ( 6V 到 60V 设备 )

### 警告

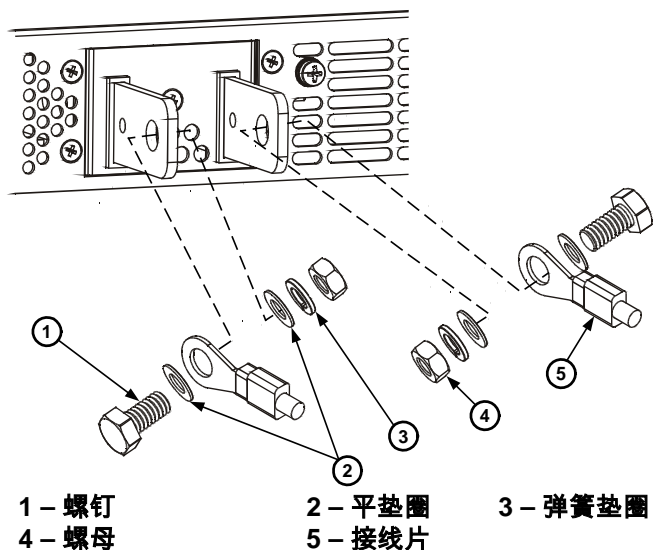
电击危险 进行后面板连接前，请关闭交流电源。所有导线和接线片必须正确连接，螺钉要拧紧。

为防止人员意外接触到危险电压，请确保负载及其接线没有可接触到的带电部件。确保负载接线的绝缘额定值大于或等于电源的最大输出电压。

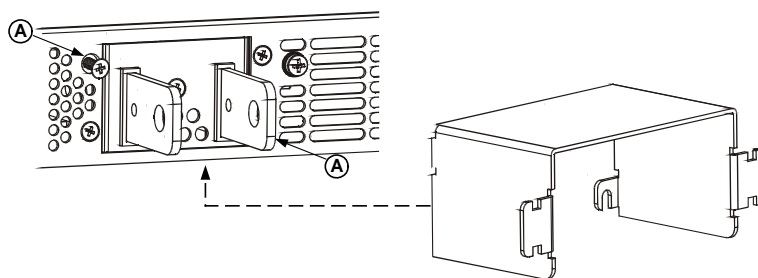
### 小心

确保安装件没有短接输出端子。较重的连接电缆必须具有电缆护套以防止连接松脱或者母线弯曲。

如下图所示，所有负载导线必须正确端接，接线端子要连接牢固。请勿在电源上使用无端接接头的导线进行负载连接。



完成负载接线后，安装遮护板。使用标有 A 字样的机箱螺钉来连接遮护板。



## 连接负载 ( 80V 到 600V 设备 )

### 警告

**电击危险** 进行后面板连接前，请关闭交流电源。所有导线和接线片必须正确连接，螺钉要拧紧。

为防止人员意外接触到危险电压，请确保负载及其接线没有可接触到的带电部件。确保负载接线的绝缘额定值大于或等于电源的最大输出电压。

80V 到 600V 型号有一个四端子线夹输出连接器。左边两个端子为正输出，右边两个端子为负输出。连接器规格如下：

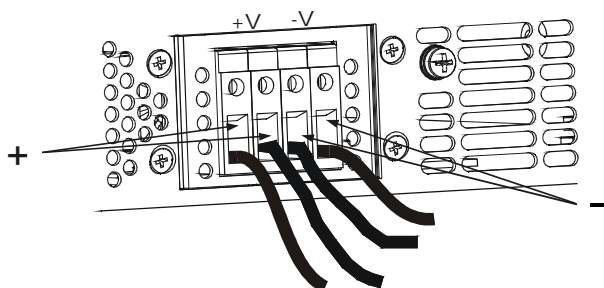
导线规格： 18 AWG 到 10 AWG

剥皮长度： 10 mm (0.39 in.)

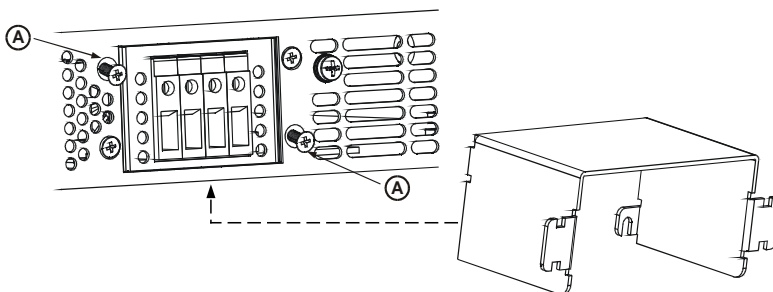
扭矩： 6.5 – 7 in-lb.

按下列步骤将负载导线连接到电源：

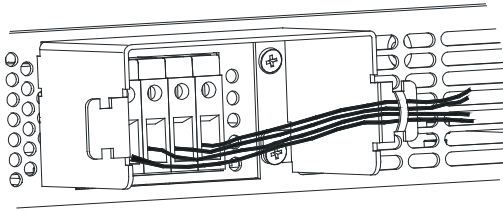
- 剥掉导线外皮大约 10 mm (0.39 in)。
- 拧松连接器端子螺钉并将已剥皮导线插入端子。拧紧端子螺钉。



- 将两个标有 A 的机箱螺钉拧松到一半位置。
- 将遮护板组装到机箱上并用两个螺钉将其固定住。



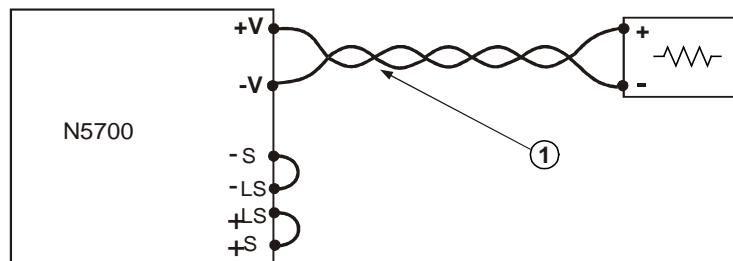
- 用束带或类似物将导线固定到一侧遮护板上。确保遮护板内的导线足够长，以便能充分消除应力。



## 输出电压感测

### 本地感测

电源出厂时已连接有后面板 J2 感测连接器，用于本地感测输出电压（请参见第 9 页）。进行本地感测时，在输出端子处进行输出电压调节。建议您仅对低负载电流应用或在负载调节不是很关键的情况下使用本地感测。

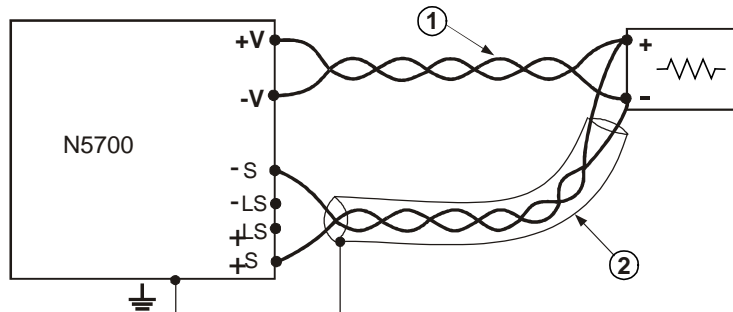


1 – 负载线。双绞线，要尽可能短。

### 远程感测

对于负载端的负载调节非常关键的应用，应该使用远程感测。远程感测允许电源自动补偿负载导线中的电压降。

使用双绞线或屏蔽导线以尽量减少拾取的噪声。如果使用屏蔽导线，则应将屏蔽层连接到一个接地点（电源机箱接地处或负载接地处）。



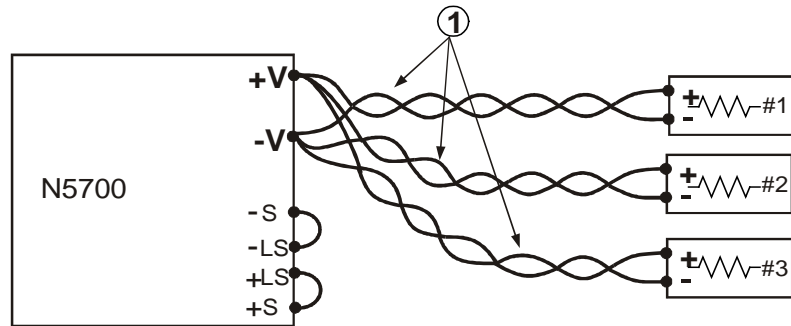
1 – 负载线。双绞线，要尽可能短。

2 – 感测线。双绞线或屏蔽导线。

## 负载注意事项

### 多个负载

下图显示连接到一个电源的多个负载。每个负载都应当使用单独的导线对连接到电源的输出端子。建议每对导线应尽可能短且扭绞在一起或使用屏蔽，以降低噪声拾取和辐射。

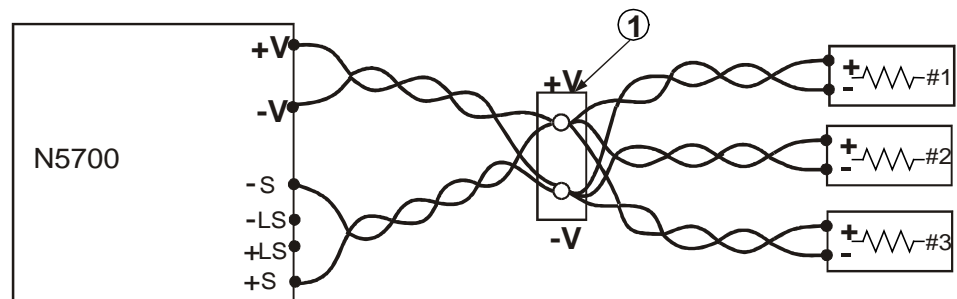


1 – 负载线。双绞线，要尽可能短。

如果使用远程配线端子（如下图所示），应使用双绞线和/或屏蔽导线将电源输出端子连接到远程配线端子。将每个负载单独连接到配线端子。建议在这些情况下使用远程电压感测。

### 电感负载

电感负载可能会产生电压尖脉冲，从而对电源造成损坏。应在输出端跨接一个二极管。二极管的额定电压和电流应大于电源的最大额定输出电压和电流。将阴极连接到电源的正输出端，将阳极连接到负输出端。



1 – 配线端子。



## 输出端接地

电源输出端与接地隔离。通过将输出端子接地，可从输出端获得正电压或负电压。不管系统在何处接地或以何种方式接地，总要使用两条导线将负载连接到输出端。为避免出现噪声问题，将输出端子接地，使其与电源机箱接地尽可能地近。

### 警告

#### 电击危险

对于额定输出高达 60 VDC 的型号，输出不得超出  $\pm 60$  VDC 以外或低于机箱接地值。

对于额定输出高达 60 VDC 的型号，输出不得超出  $\pm 600$  VDC 以外或低于机箱接地值。

对于额定输出高于 60 VDC 的型号，负输出不得超出  $\pm 400$  VDC 以外或低于机箱接地值。

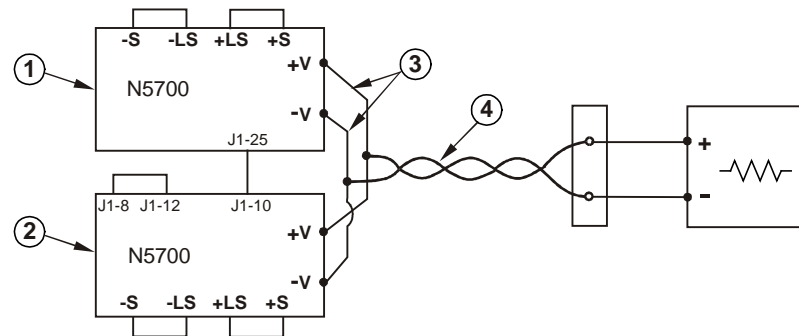
## 并联连接

### 小心

只有具有相同额定电压和电流的电源才可以并联连接。

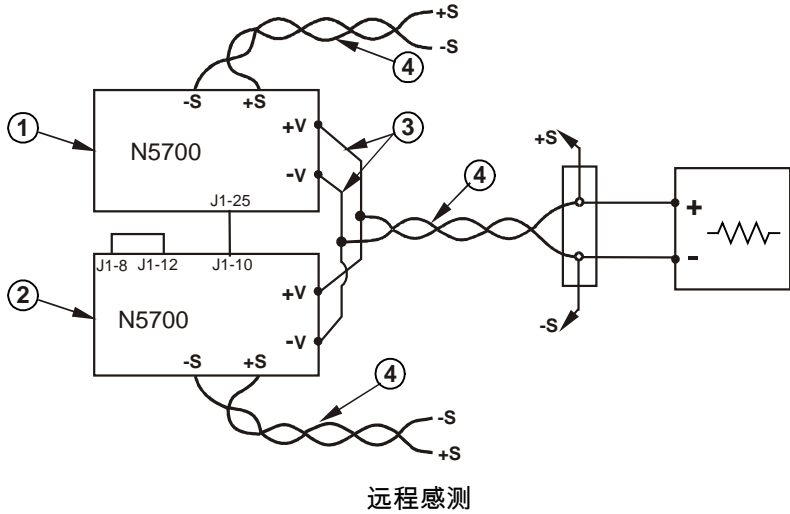
最多可将四个具有相同额定电压和电流的电源设备并联连接，以提供最高四倍的输出电流能力。下图显示两个电源设备，连接方式适用于四个电源设备。

一个电源设备可作为主电源，其余电源设备作为从电源。从电源设备用作从属于主输出电流的被控电流源。在远程工作情况下，计算机只能对主电源设备进行程序控制，而对于连接到计算机的从电源设备，只能读回其电压、电流和状态。



本地感测

1 - 主电源设备。 2 - 从电源设备。 3 - 尽可能短。 4 - 双绞线。



1 – 主电源设备。 2 – 从电源设备。 3 – 尽可能短。 4 – 双绞线。

## 设置主电源设备

如上图所示，连接感测电路以进行本地或远程感测。将主电源设备输出电压设置为需要的电压。将电流限值设定为所需负载电流限值除以并联电源数所得到的值。在工作期间，主电源设备在恒压模式下工作，将负载电压调节到设定的输出电压。

## 设置从电源设备

将后面板设置开关 SW1 位置 2 设置为“上”位置。将从电源设备的 J1 针 10 ( 电流编程 ) 连接到主电源设备的 J1 针 25 ( 并联 )。还要在 J1 针 8 和 J1 针 12 之间连接一个短路。应将从电源设备的输出电压设定为高于主电源设备的输出电压，以防止干扰主电源设备的控制。将每个电源设备的电流限值设定为所需电流限值除以并联电源数所得到的值。

## 设置过电压和过电流保护

将主电源设备过电压保护设定为需要的值。将从电源设备的过电压保护值设定为高于主电源设备。当主电源设备关闭时，它将从电源设备的输出电压设定为零。

如果需要过电流保护，只能将过电流保护用于主电源设备。当主电源设备关闭时，它将从电源设备的输出电压设定为零。

## 串行连接

### 警告

#### 电击危险

对于额定输出高达 60 VDC 的型号，输出不得超出  $\pm 60$  VDC 以外或低于机箱接地值。

对于额定输出高达 60 VDC 的型号，输出不得超出  $\pm 600$  VDC 以外或低于机箱接地值。

对于额定输出高于 60 VDC 的型号，负输出不得超出  $\pm 400$  VDC 以外或低于机箱接地值。

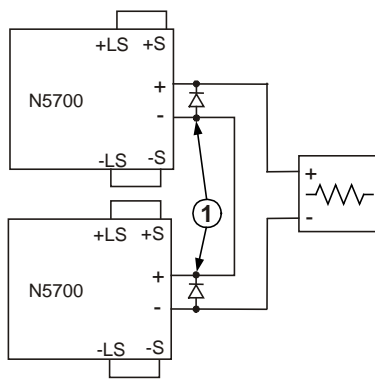
### 小心

只有具有相同额定电压和电流的电源才可以串行连接。

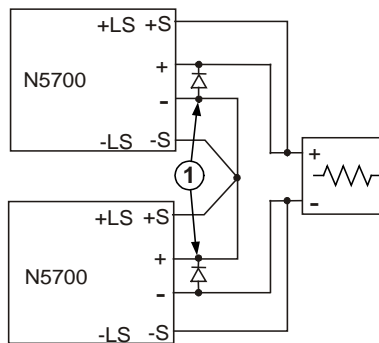
可将两个具有相同额定电压和电流的电源设备串行连接，以提供最高两倍的输出电压能力。由于串联电路中每个元件所通过的电流相同，串行连接的输出必须具有相同的电流额定值。

建议将二极管与每个输出并联连接，以防止在顺序启动期间或一个电源设备关闭时出现反向电压。每个二极管的额定值都应不低于电源的额定输出电压和输出电流。

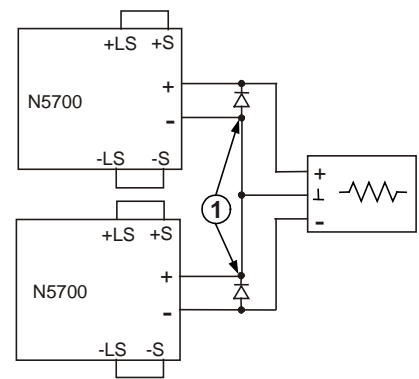
下图说明在本地和远程感测中进行的串行连接。它们还显示了配置为正输出和负输出的串联电源。



本地感测



远程感测



正输出和负输出

1 – 二极管由用户提供。

## 一般工作方式

### 恒压模式

在恒压模式下，电源将输出电压调节到所选值，而负载电流则根据负载的需要而改变。当电源在恒压模式中工作时，前面板上的 CV 指示灯点亮。

启用输出后，只需旋转电压旋钮即可设定输出电压。禁用输出后，按 LIMIT 按钮，然后旋转电压旋钮。完成调节后，DC VOLTS 显示屏将显示电压设定值 5 秒钟，然后显示 OFF（关闭）。

可将电压旋钮设置为低或高分辨率。按 FINE 按钮选择较高分辨率。FINE 指示灯亮起。

#### 注意

如果不能将输出电压调节到需要的值，电源可能在其电流限值下工作。请检查负载情况和电流限值设置。另外，最大和最小电压设置可能会受到过电压保护和欠电压限值设置的限制。

### 恒流模式

在恒流模式下，电源将输出电流调节到所选值，而电压根据负载的需要而改变。当电源在恒流模式下工作时，前面板上的 CC 指示灯点亮。

当输出启用且处于恒流模式时，只需旋转电流旋钮即可设定电流限值。如果输出处于恒压模式，按 LIMIT 按钮，然后旋转电流旋钮。完成调节后，DC AMPS 显示屏将显示电流设定值 5 秒钟，然后显示实际输出电流。

禁用输出后，按 LIMIT 按钮，然后旋转电流旋钮。完成调节后，DC AMPS 显示屏将显示电流设定值 5 秒钟，然后由于输出关闭而显示空白屏幕。

可将电流旋钮设置为低或高分辨率。按 FINE 按钮选择较高分辨率。FINE 指示灯亮起。

### CV/CC 模式转换

电源的工作模式取决于电压设置、电流限值设置和负载电阻。如果电源处于恒压模式且负载电流超过电流限值设置，电源会切换到恒流模式。如果负载电流降低到电流限值设置以下，电源会切换到恒压模式。

## CV/CC 信号

### 小心

请勿将 CV/CC 信号连接到高于 30VDC 的电压源。总是将 CV/CC 信号连接到具有串联电阻器的电压源，以将汇电流限制到 10mA 以内。

J1 连接器上可用的 CV/CC 信号指示电源的工作模式。CV/CC 信号是 J1 针 13 处具有 30V 并联齐纳二极管的集电极开路输出，并连接到 J1 针 12 的共用端。J1 针 12 从内部连接到 -S 端子。当电源在恒压模式下工作时，CV/CC 输出是开路的。当电源在恒流模式下工作时，CV/CC 信号输出为低 (0 - 0.6V)，汇电流最大为 10mA。

## 保护功能

### 过电压保护

如果输出电压超出过电压保护限值设置，则过电压保护功能会将电源输出关闭。

要设置 OVP 电平，请按 OVP/UVL 按钮使屏幕上显示 OUP。屏幕将显示 OVP 设置。旋转电压旋钮以调节 OVP 电平。OVP 和设定值会在屏幕上再显示 5 秒钟，然后返回到前一个状态。在出现过电压状况时，输出将被禁用，屏幕上显示 OVP，PROT 指示灯将闪烁。

### 欠电压限值

欠电压限值功能可防止将输出电压调节到某个限值之下。

对 UVL 的设置可在输出被启用 (On) 或禁用 (Off) 时进行。要设置 UVL 电平，请按 OVP/UVL 按钮两次使屏幕上显示 UUL。屏幕将显示 UVL 设置。旋转电压旋钮以调节 UVL 电平。UUL 和设定值会在屏幕上再显示 5 秒钟，然后返回到前一个状态。

### 过电流保护

如果负载电流超出过电流限值设置，则过电流保护功能会将电源输出关闭。

要使过电流保护功能处于待命状态，按 OCP/488 按钮，使 OCP 指示灯亮起。待命后，从恒压到恒流模式的转换将会启动过电流保护功能。在出现过电流状况时，输出将被禁用，屏幕上显示 OCP，PROT 指示灯将闪烁。

## 过热保护

如果内部温度过高，则过热保护功能会将输出关闭。在出现过热状况时，输出将被禁用，屏幕上显示 OTP，PROT 指示灯将闪烁。

## 前面板锁定

可以将前面板控制钮锁定以防止意外调节。按住 LIMIT 按钮可在“锁定”前面板和“未锁定”前面板之间切换。显示将在 LFP 和 UFP 之间循环。在显示其中一个模式时，松开 LIMIT 按钮以选择该模式。

在未锁定模式下，可以使用前面板控制钮设定并监视电源参数。

在锁定模式下，VOLTAGE 和 CURRENT 旋钮、OCP/488 按钮以及 OUT ON 按钮被禁用。屏幕将显示 LFP，以表明前面板已被锁定。OVP/UVL 按钮仍然可以使用，以便预览 OVP 和 UVL 设置。LIMIT 按钮也可以使用，用于预览输出电压和电流设置或解除锁定前面板。

## 输出开/关控制按钮

### OUT ON 按钮

使用 OUT ON 按钮可以启用或禁用输出。输出被禁用时，输出电压和电流为零，屏幕上显示 OFF。

### 输出关断端子

输出关断 (SO) 端子位于 J1 连接器上，用于启用或禁用电源输出。此功能是边沿触发的。J1 针 15 为关断输入，从内部连接的针 2 和针 3 为信号共用。所有针都与电源输出光隔离。关断输入可接受一个 2.5V 至 15V 的信号或一个用于启用或禁用输出的断开/短接触点。关断控制逻辑可通过 SW1 设置开关 5 进行选择。

在关断输入上检测到开到关的转换时，关断功能就会根据 J1 针 15 上的信号电平或断开/短接情况来启用或禁用输出。当输出被关断功能禁用后，屏幕上将显示 SO，表示输出已被禁用。

SW1 开关 5	关断信号电平	输出	显示
下 (默认)	2 – 15 V 或断开	开启	电压/电流值
	0 – 0.4V 或短接	关闭	SO
上	2 – 15 V 或断开	关闭	SO
	0 – 0.4V 或短接	开启	电压/电流值

## 启用/禁用端子

### 小心

为防止对设备造成可能的损坏，请不要将 Enable + 或 Enable - 端子连接到正或负输出端子。

启用/禁用端子位于 J1 连接器上，用于启用或禁用电源输出。此功能是电平触发的。只需在 J1 针 1 和针 14 之间连接一个开关或继电器。此功能由 SW1 设置开关 9 启动。

这些针在断开时可将输出禁用。输出被禁用时，前面板上的 PROT 指示灯将闪烁。

SW1 开关 9	ENA+/ENA- 针	输出	显示	保护指示灯
下 (默认)	没有作用	开启	电压/电流值	熄灭
上	断开	关闭	ENA	闪烁
	短接	开启	电压/电流值	熄灭

## 电源正常信号

J1 连接器上的电源正常信号可指示出电源中的故障状态。J1 针 16 是一个 TTL 输出信号。从内部连接的针 2 和 3 是信号共用。所有针都与电源输出光隔离。没有故障时，电源正常信号为高，具有 2mA 的最大源电流。出现故障时，电源正常信号为低，具有 1mA 的最大汇电流。以下故障状况会使此信号为低：

过电压保护	启用/禁用信号为真
过电流保护	关断信号为真
过热保护	接口故障
交流线路故障	输出关闭

## 安全启动和自动重启

可以对电源进行设定，使其在开启时具有上一次的工作设置（自动重启）或复位设置（安全启动）。按住 OUT ON 按钮以在安全启动模式和自动重启模式之间进行选择。显示以三秒钟间隔在 SAF 和 AUT 之间连续循环。在显示其中一个模式时，松开 OUT ON 按钮以选择该模式。

**在安全启动模式下**，设备开启后为复位设置。输出被禁用，输出电压和电流为零。

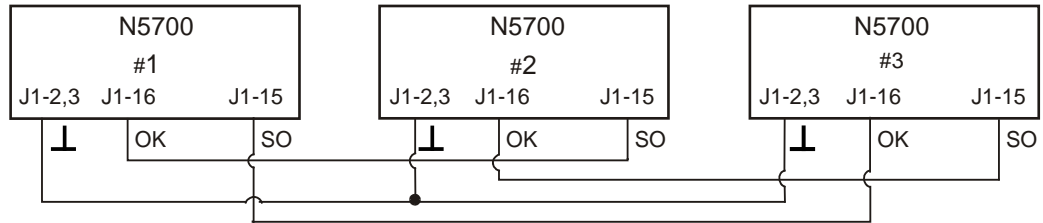
**在自动重启模式下**，电源将恢复到上一次关闭时保存的工作设置（请参见下面的列表）。根据上一次设置，输出可以为启用或禁用。

输出开/关状态	UVL 电平
输出电压设置	OCP 设置
输出电流设置	锁定/未锁定前面板
OVP 电平	启动模式

## 多设备关闭

可以将一个多电源系统配置为在其中一个电源设备出现故障时关闭所有电源设备。SW1 设置开关 5 必须位于“下”位置以启用多设备关闭功能。其他开关不受此设置的影响。

在一个电源设备出现故障时，其电压正常信号变为低，该设备的显示屏会指示出该故障。其他电源设备的显示屏上将显示 SO，然后关闭。当故障状况被清除后，所有设备都将按照其安全启动或自动重启设置恢复正常工作。



## 输出电压和电流的模拟编程

### 模拟编程控制端子

J1 连接器的针 8 可接受一个 TTL 信号或断开/短接触点开关（连接到针 12）以选择输出电压和电流的本地或模拟编程。此功能由 SW1 设置开关 1 和 2 启用或禁用。

J1 连接器的针 21 是一个集电极开路输出，可指示出电源是在本地模式还是在模拟模式。要使用此输出，请将一个工作电阻器与最大电压为 30VDC 的电压源相连。选择的工作电阻器应该使汇电流在输出处在低状态时小于 5mA。

SW1 开关 1 和 2	J1 针 8 功能	J1 针 21 信号	输出电压/电流控制
两个都在“下”位置 (默认)	无效果	断开	本地
一个或两个都在“上”位置	0 或短接	0~0.6V	模拟
	1 或断开	断开	本地



## 输出电压和电流的电压编程

### 小心

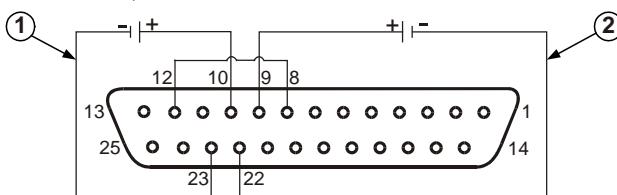
J1 针 12、针 22 和针 23 从内部连接到负感测端子。不要将这些针与该负感测端子外的任何端子进行连接，因为这样可能会对设备造成损坏。

要保持电源的隔离状态并防止形成接地回路，请在用模拟编程操作设备时使用一个隔离编程源。

0–5 V 或 0–10 V 的电压编程源可用于对输出电压和电流限值进行从零到满刻度编程。设置 SW1 设置开关 3，以根据下表选择编程电压范围。确保将 SW1 设置开关 1 和 2 设置在“上”位置，开关 7 和 8 设置在“下”位置。

SW1 开关 3	电压编程 (J1 针 9)	电流量程编程 (J1 针 10)
下 (默认)	0–5 V	0–5 V
上	0–10 V	0–10 V

如下图所示，将编程源连接到 J1 的配接插头。检查电压源的极性是否正确。另外，在 J1 针 8 和 J1 针 12 之间连接一条短接线。



1 – 电流限值编程。 2 – 输出电压编程。

## 输出电压和电流的电阻编程

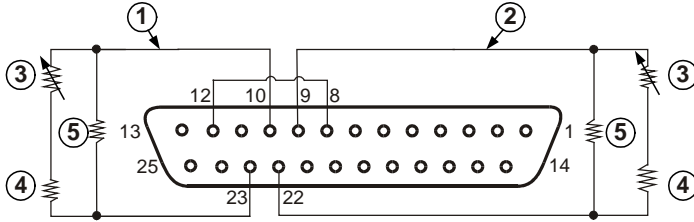
### 小心

J1 针 12、针 22 和针 23 从内部连接到负感测端子。不要将这些针与该负感测端子外的任何端子进行连接，因为这样可能会对设备造成损坏。

可选择 0–5 k $\Omega$  或 0–10 k $\Omega$  的电阻对输出电压和电流限值进行从零到满刻度的编程。请仅使用稳定、噪声低且温度系数小于 50ppm 的电阻器。设置 SW1 设置开关 3，以根据下表选择编程电阻范围。确保 SW1 设置开关 1、2、7 和 8 全部设置在“上”位置。

SW1 开关 3	电压编程 (J1 针 9)	电流量程编程 (J1 针 10)
下 (默认)	0–5 k $\Omega$	0–5 k $\Omega$
上	0–10 k $\Omega$	0–10 k $\Omega$

如下图所示，将编程电阻器连接到 J1 的配接插头。用一个可变电阻器可控制其整个范围内的输出，用可变电阻器和串联/并联电阻器的组合可控制一个限定范围内的输出。另外，在 J1 针 8 和 J1 针 12 和 J1 针 23 之间连接一条短接线。



- 1 – 电流限值编程。
- 2 – 输出电压编程。
- 3 – 编程电阻器。
- 4 – 可选，设置下限值。
- 5 – 可选，设置上限值。

## 输出电压和电流的外部监视

J1 连接器还可提供用于监视输出电压和电流的模拟信号。通过 SW1 设置开关 4 可选择电压范围 0–5 V 或 0–10 V。监视信号代表电源额定输出电压和电流的 0 至 100%。监视器的输出具有一个 500 Ω 的串联输出电阻。确保感测电路具有一个大于 500 kΩ 的输入电阻，否则精度将会降低。

SW1 开关 4	电压范围	J1 信号连接	信号功能
下 (默认)	0–5 V	J1 针 11	电压监视
		J1 针 24	电流监视
上	0–10 V	J1 针 11	电压监视
		J1 针 24	电流监视

J1 针 12 是用于 J1 针 11 和 24 的共用信号。

## 配置和使用远程接口

Keysight N5700 直流电源支持通过三种接口进行远程接口通信：GPIB、USB 和 LAN。所有三个接口在接通电源时均处于加电状态。有关配置和使用远程接口的信息，请参见仪器随附的《用户指南》。



此信息如有变更，恕不另行通知。  
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# Système d'alimentation CC Keysight Technologies Série N5700

Aide-mémoire



## Consignes de sécurité

Les consignes de sécurité présentées dans cette section doivent être appliquées au cours des différentes phases d'utilisation de cet appareil. Le non-respect de ces précautions ou des avertissements et instructions spécifiques mentionnés dans ce manuel constitue une violation des normes de sécurité établies lors de la conception, de la fabrication et de l'usage normal de l'instrument. Keysight Technologies ne peut être tenu responsable du non-respect de ces consignes.

### Généralités

N'utilisez ce produit que de la manière préconisée par le constructeur. Les fonctions de protection de ce produit risquent d'être endommagées si vous ne respectez pas les instructions d'utilisation.

### Avant la mise sous tension

Vérifiez que vous avez bien respecté toutes les consignes de sécurité. Faites tous les branchements à l'appareil avant de le mettre sous tension. Notez les marquages externes à l'instrument décrits à la section "Symboles de sécurité".

### Mise à la terre de l'instrument

Ce produit est un instrument de mesure de la catégorie de sécurité 1 (il comporte une borne de terre de protection). Afin de minimiser les risques d'électrocution, son châssis et son capot doivent être reliés à une terre électrique. L'instrument doit être relié à une source de courant alternatif par l'intermédiaire d'un cordon d'alimentation secteur pourvu d'un fil de terre connecté fermement à une terre électrique (terre de sécurité) au niveau de la prise de courant. Toute interruption du conducteur de protection (mise à la terre) ou tout débranchement de la borne de terre de protection donne lieu à un risque d'électrocution pouvant se traduire par des accidents graves.

### Fusibles

L'instrument contient un fusible interne, auquel l'utilisateur n'a pas accès.

### Ne pas utiliser en atmosphère explosive

N'utilisez pas l'instrument en présence de gaz ou de vapeurs inflammables.

### Ne pas démonter le capot de l'instrument

Seules des personnes qualifiées, formées à la maintenance et conscientes des risques d'électrocution encourus peuvent démonter les capots de l'instrument. Débranchez toujours le cordon d'alimentation secteur et tous les circuits externes avant de démonter le capot de l'instrument.

### Ne pas modifier l'instrument

N'installez pas de composants de remplacement et n'apportez aucune modification non autorisée à l'appareil. Pour toute opération de maintenance ou de réparation, renvoyez l'appareil à un bureau de vente et de service après-vente, afin d'être certain que les fonctions de sécurité seront sauvegardées.

### En cas de dommages

Les instruments endommagés ou défectueux ne doivent pas être utilisés. Il est conseillé de les placer dans un lieu sûr en attendant qu'ils soient réparés par le personnel qualifié.




















### ATTENTION

La mention **ATTENTION** indique un risque. Si la procédure, le procédé ou les consignes ne sont pas exécutés correctement, le produit risque d'être endommagé ou les données d'être perdues. En présence de la mention **ATTENTION**, il convient de ne pas continuer tant que les conditions indiquées n'ont pas été parfaitement comprises et respectées.

### AVERTISSEMENT

Une mention **AVERTISSEMENT** signale un danger. Si la procédure, le procédé ou les consignes ne sont pas exécutés correctement, les personnes risquent de s'exposer à des lésions graves. En présence d'une mention **AVERTISSEMENT**, il convient de s'interrompre tant que les conditions indiquées n'ont pas été parfaitement comprises et respectées.

## Symboles de sécurité

	Courant continu.
	Courant alternatif.
	Courant à la fois continu et alternatif.
	Courant alternatif triphasé.
	Borne de terre (masse).
	Borne de terre de protection.
	Borne reliée au cadre ou au châssis.
	Borne au potentiel de terre.
	Conducteur neutre sur un équipement installé en permanence.
	Conducteur de phase sur un équipement installé en permanence.
	Alimentation en marche.
	Alimentation à l'arrêt.
	Alimentation en mode veille. L'appareil n'est pas complètement déconnecté du secteur si l'interrupteur est à l'arrêt.
	Position Marche d'un interrupteur par bouton poussoir bi-stable.
	Position Arrêt d'un interrupteur par bouton poussoir bi-stable.
	Attention, danger d'électrocution.
	Attention, surface chaude.
	Attention. Consultez la documentation fournie.
	Ne pas éliminer avec les ordures ménagères.

## Dispositions légales

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# Système d'alimentation en courant continu Keysight N5700 : présentation succincte

Le système d'alimentation en courant continu Keysight Technologies série N5700 est composé d'alimentations à usage universel avec une grande diversité de courants et de tensions de sortie.

Ces alimentations ont un facteur de puissance corrigé et fonctionnent à partir d'une plage de tension alternative largement répandue dans le monde. Le courant et la tension de sortie sont affichés en permanence ; des voyants à diodes électroluminescentes indiquent l'état de fonctionnement complet de l'alimentation.

Via les commandes en face avant, l'utilisateur peut régler les paramètres de sortie et les niveaux de protection contre surtensions, sous-tensions et surintensités et afficher les réglages.

La face arrière comporte les connecteurs nécessaires pour contrôler et surveiller le fonctionnement de l'alimentation via des signaux analogiques ou des interfaces intégrées de communication distante.

## Caractéristiques de sortie

- Tension constante/courant constant avec basculement automatique entre les deux modes.
- Commandes en face avant de la tension et du courant à haute résolution.
- Relecture précise de la tension et du courant.
- Coupure déclenchée de manière externe sur fronts indépendants et activation/désactivation déclenchée de manière externe par niveaux de signal.
- Fonctionnement en mode parallèle maître/esclave avec partage actif du courant.
- Régulation à distance de la tension pour compenser la chute dans les fils de liaison avec la charge.
- Programmation et surveillance par sorties analogiques.

## Caractéristiques système

- Interface GBIB/LAN/USB intégrée.
- Serveur Web intégré pour contrôler l'instrument directement, via un navigateur Internet.
- Empilement sans perte de place : pas d'ouverture de ventilation sur les couvercles supérieur et inférieur.
- Tension d'entrée universelle avec correction active du facteur de puissance.
- Contrôle de la vitesse du ventilateur pour réduire le bruit et allonger sa durée de vie.



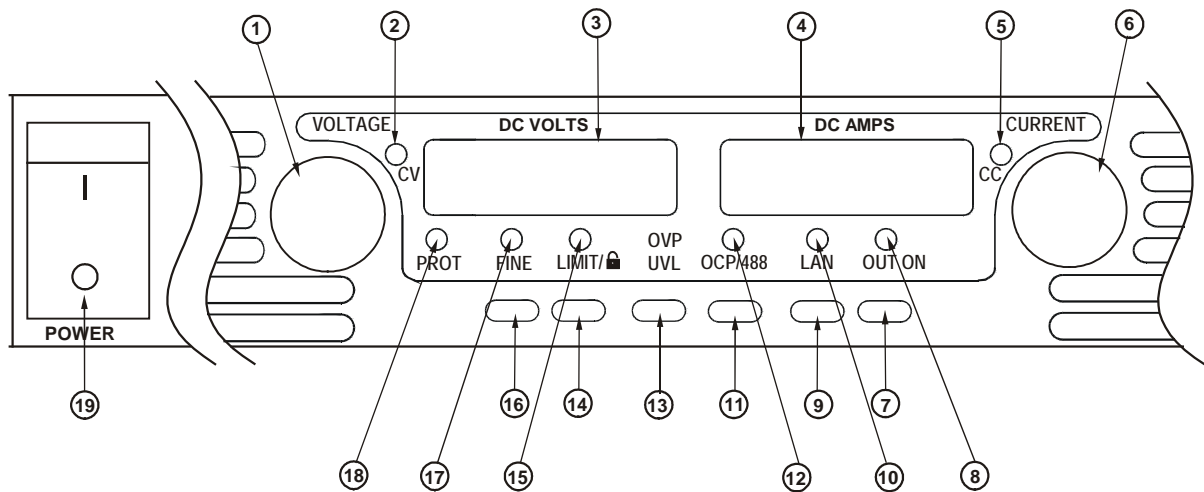
## Fonctions programmables

- Réglage de la tension et du courant de sortie.
- Mesure de la tension et du courant de sortie.
- Réglage du déclenchement de la tension et du courant de sortie.
- Commande d'activation/de désactivation de la sortie.
- Réglage de la protection contre les surintensités.
- Réglage et relecture de la protection contre les surtensions.
- Réglage et relecture de la limite de sous-tension.
- Mode de démarrage (selon le dernier réglage ou en réinitialisation).
- Réglage et relecture de registres d'état.
- Déclenchement par bus.
- Etalonnage.

## Tension et courant selon les modèles

Modèle	Plage de tension	Plage de courant	Modèle	Plage de tension	Plage de courant
N5741A	0-6 V	0-100 A	N5761A	0-6 V	0-180 A
N5742A	0-8 V	0-90 A	N5762A	0-8 V	0-165 A
N5743A	0-12,5 V	0-60 A	N5763A	0-12,5 V	0-120 A
N5744A	0-20 V	0-38 A	N5764A	0-20 V	0-76 A
N5745A	0-30 V	0-25 A	N5765A	0-30 V	0-50 A
N5746A	0-40 V	0-19 A	N5766A	0-40 V	0-38 A
N5747A	0-60 V	0-12,5 A	N5767A	0-60 V	0-25 A
N5748A	0-80 V	0-9,5 A	N5768A	0-80 V	0-19 A
N5749A	0-100 V	0-7,5 A	N5769A	0-100 V	0-15 A
N5750A	0-150 V	0-5 A	N5770A	0-150 V	0-10 A
N5751A	0-300 V	0-2,5 A	N5771A	0-300 V	0-5 A
N5752A	0-600 V	0-1,3 A	N5772A	0-600 V	0-2,5 A

## Face avant : présentation succincte



### 1-Bouton VOLTAGE (tension)

Fonction de tension : règle la tension de sortie, le niveau de protection contre les surtensions et la limite de sous-tension. Si une protection contre les surtensions ou des limites de sous-tension ont été définies, vous ne pourrez pas programmer la tension de sortie en dehors de ces limites.

Adresse GPIB : sélectionne l'adresse GPIB si l'on maintient le bouton OCP/488 enfoncé.

### 2-Voyant CV (tension constante)

Lorsqu'il est allumé, ce voyant indique que l'alimentation fonctionne en mode de tension constante, la tension de sortie étant effectivement maintenue constante.

### 3-Ecran DC VOLTS (tension continue)

Cet écran présente normalement la tension mesurée sur les bornes de mesure. Si l'on appuie sur le bouton LIMIT, l'écran indique la tension programmée. Si l'on appuie sur le bouton OVP/UVL, l'écran indique le niveau de protection contre les surtensions (OVP) ou la limite de sous-tension (UVL). Si l'on maintient le bouton OCP/488 enfoncé, l'écran indique l'adresse GPIB. Lorsque vous appuyez sur le bouton LAN et le maintenez enfoncé, l'écran indique les adresses IP et Ethernet.

### 4-Ecran DC AMPS (courant continu)

Cet écran présente normalement le courant mesuré sur les bornes de sortie. Si l'on appuie sur le bouton LIMIT, l'écran indique le courant programmé. Lorsque vous appuyez sur le bouton LAN et le maintenez enfoncé, l'écran indique les adresses IP et Ethernet.

### 5-Voyant CC (courant constant)

Lorsqu'il est allumé, ce voyant indique que l'alimentation fonctionne en mode de courant constant, le courant de sortie étant effectivement maintenu constant.

### 6-Bouton CURRENT (courant)

Règle le courant de sortie.

### 7-Bouton OUT ON (activation de la sortie)

Fonction de sortie : appuyez sur OUT ON pour activer ou désactiver la sortie. Appuyez sur OUT ON pour réinitialiser et réactiver la sortie après qu'un événement OVP (protection contre les surtensions) ou OCP (protection contre les surintensités) s'est produit.

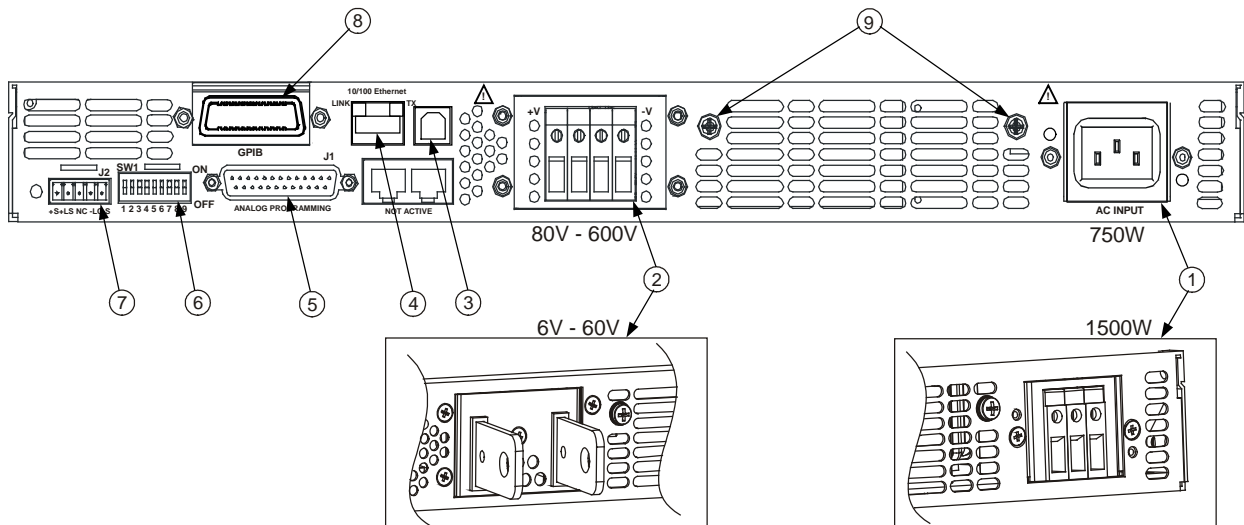
Fonction de démarrage : sélectionne le mode Safe-Start (démarrage de sécurité) ou Auto-Restart (redémarrage automatique). Maintenez le bouton OUT ON enfoncé pour passer du mode Safe-Start au mode Auto-Restart. L'écran affiche SAF ou AUT. Si l'on relâche le bouton OUT ON, le mode correspondant à celui affiché est sélectionné.

### 8-Voyant OUT ON (activation de la sortie)

Lorsqu'il est allumé, ce voyant indique que la sortie est activée.

<b>9-Bouton LAN</b>	<p><u>Affichage des adresses</u> : appuyez sur le bouton LAN pour afficher les adresses IP et Ethernet. L'écran fait défiler les quatre segments de l'adresse IP, puis les six segments de l'adresse Ethernet (EA). Appuyez sur n'importe quelle touche pour annuler l'affichage des adresses.</p> <p><u>Réinitialisation des adresses</u> : appuyez sur le bouton LAN et maintenez-le enfoncé pendant 3 secondes. A l'affichage du message "LAN rES", appuyez à nouveau sur le bouton LAN pour réinitialiser la configuration LAN à ses paramètres par défaut définis en usine. Reportez-vous au Guide de l'utilisateur pour connaître ces paramètres.</p>
<b>10-Voyant LAN</b>	<p>Le voyant allumé indique que le LAN a été configuré et qu'il fonctionne normalement. Le voyant clignotant indique que le LAN identifie l'unité dont la page d'accueil Web a configuré le voyant de sorte qu'il clignote.</p>
<b>11-Bouton OCP/488 (protection contre les surintensités)</b>	<p><u>Fonction d'activation</u> : appuyez sur OCP/488 pour activer la protection contre les surintensités. Appuyez à nouveau sur OCP/488 pour désactiver cette protection.</p> <p><u>Réinitialisation OCP</u> : lorsqu'un événement de protection contre les surintensités se produit, appuyez sur le bouton OUT ON pour activer la sortie et réarmer cette protection.</p> <p><u>Adresse GPIB</u> : Appuyez sur le bouton OCP/488 et maintenez-le enfoncé pendant trois secondes. Cela vous permet de définir l'adresse GPIB avec le bouton VOLTAGE.</p>
<b>12-Voyant OCP</b>	<p>Lorsqu'il est allumé, ce voyant indique que la protection contre les surintensités est activée.</p>
<b>13-Bouton OVP/UVL (protection contre les surtensions/limite de sous-tension)</b>	<p><u>Fonction OVP</u> : appuyez une fois sur OVP/UVL pour régler le niveau de protection contre les surtensions avec le bouton VOLTAGE (l'écran indique OUP). Vous ne pouvez pas régler la protection contre les surtensions à moins d'environ 5 % au dessus du réglage actuel de la tension de sortie.</p> <p><u>Fonction UVL</u> : appuyez deux fois sur OVP/UVL pour régler la limite de programmation de sous-tension avec le bouton VOLTAGE (l'écran indique UUL). Vous ne pouvez pas régler la protection contre les sous-tensions à plus d'environ 5 % en dessous du réglage actuel de la tension de sortie.</p>
<b>14-Bouton LIMIT (limite)</b>	<p><u>Fonction de limite</u> : appuyez sur LIMIT pour afficher la limite de la tension et du courant de sortie. Pendant cinq secondes, l'écran indique les réglages puis revient à l'affichage de la tension et du courant de sortie réels.</p> <p><u>Fonction de verrouillage</u> : maintenez le bouton LIMIT enfoncé pour passer du verrouillage au déverrouillage de la face avant. L'écran affiche LFP (verrouillage) ou UFP (déverrouillage). Si l'on relâche le bouton LIMIT, le mode correspondant à celui affiché est sélectionné. Si l'écran affiche rLFP, cela indique que le panneau avant a été verrouillé par une commande de programmation à distance.</p>
<b>15-Voyant LIMIT (limite)</b>	<p>Lorsqu'il est allumé, ce voyant indique que le bouton LIMIT est enfoncé.</p>
<b>16-Bouton FINE (réglage fin)</b>	<p>Sélectionne le mode de réglage fin ou grossier. En mode de réglage fin, les boutons VOLTAGE et CURRENT fonctionnent avec une résolution élevée ; en mode grossier, la résolution est faible (approximativement six tours).</p>
<b>17-Voyant FINE (réglage fin)</b>	<p>Lorsqu'il est allumé, ce voyant indique que l'alimentation est en mode de réglage fin.</p>
<b>18-Voyant PROT (protection)</b>	<p>Lorsqu'il clignote, ce voyant indique qu'une anomalie s'est produite. La détection d'une anomalie OVP, OCP, OTP, Enable et AC provoque le clignotement du voyant PROT. Ce voyant peut clignoter et l'écran peut afficher AC pendant quelques secondes après l'extinction de l'alimentation en raison de l'énergie résiduelle présente à l'intérieur de l'appareil.</p>
<b>19-Interrupteur POWER (mise sous tension)</b>	<p>Allume et éteint l'appareil.</p>

## Face arrière : présentation succincte

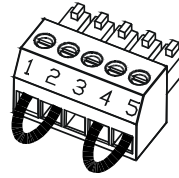


- |   |  |
|---|--|
| <b>1-Connecteur d'entrée secteur</b>            | Bornier de fils sur les modèles de puissance de sortie de 1 500 W.<br>Connecteur CEI sur les modèles de puissance de sortie de 750 W.  |
| <b>2-Connecteur de sortie CC</b>                | Borniers de fils sur les modèles de 80 V à 600 V.<br>Barres conductrices sur les modèles 6 V à 60 V.   |
| <b>3-Connecteur USB</b>                         | Connecteur pour branchement à une interface USB.   |
| <b>4-Connecteur LAN</b>                         | Connecteur pour branchement à une interface LAN. Le voyant LINK indique l'intégrité de la liaison. Le voyant TX indique l'activité du réseau LAN. Reportez-vous au guide d'utilisation (User's Guide) pour la configuration du réseau LAN.   |
| <b>5-Connecteur de programmation analogique</b> | Connecteur pour l'interface analogique. Il inclut les signaux de programmation et de surveillance de la tension et du courant de sortie, le signal électrique de commande de coupure, la commande d'activation/désactivation (contacts secs), le témoin de bon fonctionnement de l'alimentation et le signal de mode de fonctionnement (tension constante/courant constant) (reportez-vous à la page suivante pour plus de détails). |
| <b>6-Commutateur de configuration SW1</b>       | Commutateur à neuf positions pour sélectionner les modes de programmation et de surveillance de la tension de sortie, la limite de courant et d'autres fonctions de commande (reportez-vous à la page suivante pour plus de détails).  |
| <b>7-Connecteur de mesure à distance</b>        | Connecteur pour réaliser des connexions de régulation à distance afin de réguler la tension au niveau de charge en compensant ainsi la chute de tension dans les fils (reportez-vous à la page suivante pour plus de détails).   |
| <b>8-Connecteur GPIB</b>                        | Connecteur pour branchement à une interface GPIB.  |
| <b>9-Vis de masse</b>                           | Vis M4x8 pour réaliser des branchements de masse au châssis.   |

**AVERTISSEMENT** RISQUE D'ELECTROCUTION Le cordon d'alimentation secteur assure une mise à la terre du châssis par l'intermédiaire d'un troisième conducteur. Vérifiez que votre prise de courant est de type trois conducteurs, la broche appropriée étant reliée à la terre.

## Connecteur de mesure J2

- 1-Mesure à distance (+)
- 2-Mesure locale (+)
- 3-Non utilisé
- 4-Mesure locale (-)
- 5-Mesure à distance (-)



- Type de prise : MC 1.5/5-ST-3.81, Phoenix
- Section des fils : 0,08 mm<sup>2</sup> à 1,3 mm<sup>2</sup>
- Longueur dénudée : 7 mm
- Couple : 0,22-0,25 Nm

La configuration d'usine est illustrée par la figure.

## Commutateur de configuration SW1

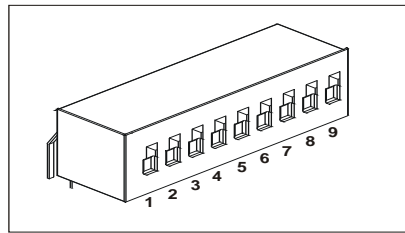
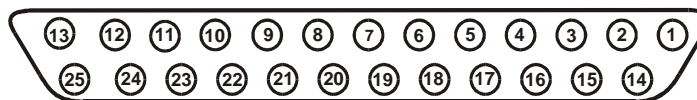


Fig.4-3: SW1 setup DIP switch

Tous les commutateurs sont en position basse dans la configuration d'usine.

- |   |  |
|---|--|
| 1-Tension de sortie, programmation par tension        | <p><u>Bas</u>: la tension de sortie est programmée par la face avant.</p> <p><u>Haut</u>: la tension de sortie est programmée par le signal de tension externe.</p>  |
| 2-Courant de sortie, programmation par tension        | <p><u>Bas</u>: le courant de sortie est programmé par la face avant.</p> <p><u>Haut</u>: le courant de sortie est programmé par le signal de tension externe.</p>  |
| 3-Plage de programmation (tension/résistance)         | <p><u>Bas</u>: la plage de programmation à distance est : 0-5 V/0-5 k<math>\Omega</math>.</p> <p><u>Haut</u>: la plage de programmation à distance est : 0-10 V/0-10 k<math>\Omega</math>.</p>   |
| 4-Plage de surveillance tension et courant            | <p><u>Bas</u>: la plage de surveillance à distance est : 0-5 V.</p> <p><u>Haut</u>: la plage de surveillance à distance est : 0-10 V</p>   |
| 5-Polarité logique de coupure                         | <p><u>Bas</u>: SORTIE DESACTIVEE = niveau bas (0-0,6 V) ou court-circuit ; SORTIE ACTIVEE = niveau haut (2 V-15 V) ou circuit ouvert.</p> <p><u>Haut</u>: SORTIE DESACTIVEE = niveau haut (2 V-15 V) ou circuit ouvert ; SORTIE ACTIVEE = niveau bas (0-0,6 V) ou court-circuit.</p> |
| 6-Non utilisé   |  |
| 7-Tension de sortie, programmation par une résistance | <p><u>Bas</u>: la tension de sortie est programmée par la face avant.</p> <p><u>Haut</u>: la tension de sortie est programmée par la résistance externe.</p>   |
| 8-Courant de sortie, programmation par une résistance | <p><u>Bas</u>: le courant de sortie est programmé par la face avant.</p> <p><u>Haut</u>: le courant de sortie est programmé par la résistance externe.</p>   |
| 9-Contrôle d'activation/désactivation                 | <p><u>Bas</u>: Les broches Activation+/Activation- de J1 ne sont pas actives.</p> <p><u>Haut</u>: Les broches Activation+/Activation- de J1 sont actives.</p>  |

## Connecteur de programmation analogique J1



**Prise adaptable :** Numéro de référence AMP 745211-2  
**Section des fils :** 0,13 mm<sup>2</sup> à 0,33 mm<sup>2</sup>  
**Outils d'extraction :** Numéro de référence AMP 91232-1 ou équivalent

La configuration d'usine par défaut correspond à un fonctionnement local qui ne nécessite pas de branchement au connecteur J1.

<b>Broche 1 :</b>	<b>Activation Entrée</b>	Reliez la broche 1 à la broche 14 pour activer la sortie. Coupez cette liaison pour désactiver la sortie.
<b>Broches 2, 3 :</b>	<b>Commun du châssis</b>	Retour du signal pour les broches 15 et 16. Reliées au châssis.
<b>Broches 4–7 :</b>	<b>Non utilisées</b>	Pas de connexion.
<b>Broche 8 :</b>	<b>Programmation locale/analogique</b>	Entrée pour sélection de la programmation de la sortie depuis la face avant ou analogique.
<b>Broche 9 :</b>	<b>Programmation de la tension</b>	Entrée pour programmation de la tension de sortie par une tension ou une résistance.
<b>Broche 10 :</b>	<b>Programmation du courant</b>	Entrée pour programmation du courant de sortie par une tension ou une résistance.
<b>Broche 11 :</b>	<b>Surveillance de la tension</b>	Sortie pour surveillance de la tension de sortie.
<b>Broche 12 :</b>	<b>Commun</b>	Retour du signal des broches 8, 11, 13 et 24. Reliée intérieurement à –S.
<b>Broche 13 :</b>	<b>Tension constante/ Courant constant</b>	Sortie pour indication du mode tension constante/courant constant.
<b>Broche 14 :</b>	<b>Activation Sortie</b>	Reliez la broche 14 à la broche 1 pour activer la sortie. Coupez cette liaison pour désactiver la sortie.
<b>Broche 15 :</b>	<b>Coupure</b>	Entrée pour contrôle de la coupure de la sortie. Référencée au commun du châssis.
<b>Broche 16 :</b>	<b>Témoin de bon fonctionnement de l'alimentation</b>	Sortie pour indiquer l'état de l'alimentation. Référencée au commun du châssis.
<b>Broches 17–20 :</b>	<b>Non utilisées</b>	Pas de connexion.
<b>Broche 21 :</b>	<b>Etat de programmation locale/analogique</b>	Sortie pour indication du mode de programmation locale ou analogique.
<b>Broche 22 :</b>	<b>Retour prog. tension</b>	Retour du signal pour la broche 9. Reliée intérieurement à –S.
<b>Broche 23 :</b>	<b>Retour prog. courant</b>	Retour du signal pour la broche 10. Reliée intérieurement à –S.
<b>Broche 24 :</b>	<b>Surveillance du courant</b>	Sortie pour surveillance du courant de sortie.
<b>Broche 25 :</b>	<b>Parallèle</b>	Sortie pour équilibrage du courant en fonctionnement parallèle.

# Installation de l'appareil

## Consignes de sécurité

Cette alimentation est un appareil de la catégorie de sécurité 1, ce qui signifie qu'elle possède une borne de terre de protection, qui doit être reliée à la terre via une prise d'alimentation secteur équipée d'une borne de terre. Pour plus d'informations sur la sécurité, reportez-vous aux consignes de sécurité au début de ce document.

## Environnement

**AVERTISSEMENT** N'utilisez pas l'appareil en présence de gaz inflammables ou de fumées.

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**ATTENTION** N'obstruez pas l'entrée de ventilation à l'avant de l'appareil ou la sortie à l'arrière.

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L'appareil ne doit fonctionner que dans des locaux fermés sous environnement contrôlé. La température ambiante ne doit pas dépasser 40° C.

Des ventilateurs refroidissent l'appareil en aspirant de l'air à l'avant et en le rejetant à l'arrière. L'espace doit être d'au moins 10 cm à l'avant et à l'arrière afin d'assurer une ventilation correcte.

## Installation en baie

Les alimentations Keysight N5700 peuvent être installées dans un panneau ou une armoire de baie standard de 19 pouces. Pour installer l'alimentation dans une baie :

1. Utilisez les brides de montage en baie du panneau avant pour installer l'alimentation dans la baie.
2. Utilisez une bride de support pour fournir un support adéquat à l'arrière de l'alimentation.
3. Pour installer l'alimentation sur des glissières dans une baie d'équipements standard de 19 pouces, utilisez le kit de glissières de montage en baie Keysight N5740A. Trois vis #10 32 x 3/8 pouces (max.) sont nécessaires de chaque côté. Pour éviter tout dommage, n'utilisez que des vis de la longueur indiquée.

## Nettoyage

**AVERTISSEMENT** **RISQUE D'ELECTROCUTION** Pour éviter tout risque, débranchez l'alimentation avant le nettoyage.

---

Utilisez un chiffon sec ou légèrement humidifié avec de l'eau pour nettoyer les parties externes. Ne tentez aucun nettoyage interne.

## Branchement du cordon d'alimentation secteur

**AVERTISSEMENT** RISQUE D'ELECTROCUTION Le cordon d'alimentation secteur assure une mise à la terre du châssis par l'intermédiaire d'un troisième conducteur. Vérifiez que votre prise de courant est de type trois conducteurs, la broche appropriée étant reliée à la terre.

RISQUE D'INCENDIE N'utilisez que le cordon d'alimentation secteur fourni avec votre instrument. L'utilisation d'autres types de cordon d'alimentation secteur peut provoquer une surchauffe de celui-ci, avec un risque d'incendie.

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**REMARQUE** Le cordon d'alimentation secteur amovible peut servir de dispositif de débranchement d'urgence. En le retirant, l'utilisateur débranche l'entrée secteur de l'appareil.

---

L'entrée secteur à l'arrière de l'appareil est de type universel. Elle accepte des tensions d'alimentation secteur comprises entre 85 V CA et 265 V CA. La plage de fréquence est comprise entre 47 Hz et 63 Hz.

La consommation nominale de courant requise est de 10,5 A sous 100 V CA et de 5 A sous 200 V CA pour les alimentations de 750 W. Elle est de 21 A sous 100 V CA et de 11 A sous 200 V CA pour les alimentations de 1 500 W.

### Branchement d'entrée pour les alimentations 750 W

Branchez le cordon d'alimentation secteur au connecteur CEI 320 à l'arrière de l'appareil. Ce connecteur assure une mise à la terre de sécurité si le cordon d'alimentation est branché sur une prise secteur elle-même mise à la terre.

Si le cordon d'alimentation livré avec votre appareil est incorrect, contactez le bureau de vente et d'assistance Keysight le plus proche.

### Branchement d'entrée pour les alimentations 1 500 W

**ATTENTION** Le branchement de cette alimentation au secteur doit être réalisé par un électricien ou tout autre personnel qualifié.

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Le connecteur d'entrée secteur est un bornier à trois fils sur la face arrière. Utilisez les fils et couples de serrage appropriés.

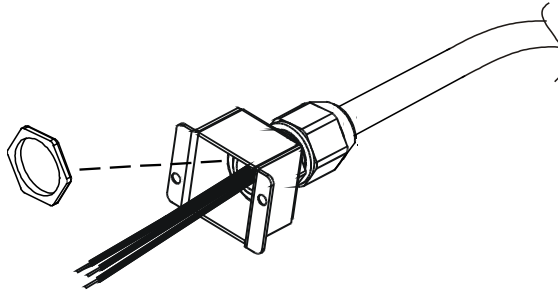
**Section des fils :** 3,1 mm<sup>2</sup> ou 5,2 mm<sup>2</sup>

**Couple :** 0,73-0,79 Nm

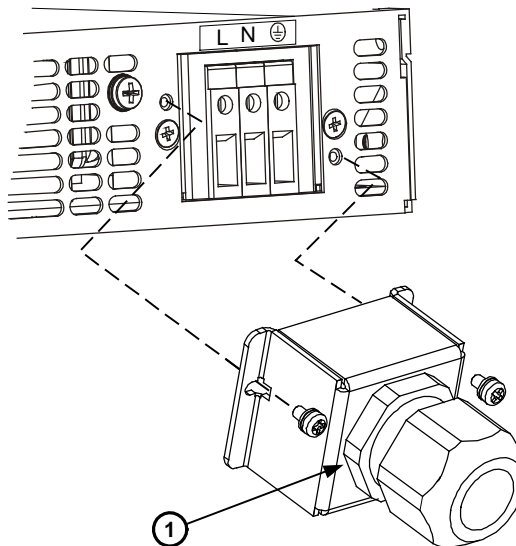


Branchez le câble au connecteur d'entrée secteur comme suit :

- Retirez l'isolant externe du câble sur environ 10 cm. Coupez les fils de sorte que le fil de terre mesure 10 mm de plus que les autres. Dénudez l'extrémité de chaque fil sur 14 mm.
- Dévissez l'embase du serre-câble de l'écrou à compression. Placez l'écrou de blocage dans le couvercle de l'entrée secteur. Insérez l'embase à travers l'ouverture du couvercle de l'entrée secteur et vissez l'embase à fond dans l'écrou de blocage.



- Glissez l'écrou à compression sur le câble secteur. Insérez les fils dénudés à travers l'embase du serre-câble jusqu'à ce que la gaine externe du câble arrive au ras du bord de l'embase. Placez un écrou sur la base pour l'empêcher de tourner. Serrez l'écrou à compression sur l'embase tout en maintenant le câble en place.
- Acheminez soigneusement les fils jusqu'aux bornes du connecteur d'entrée. Pour brancher les fils, desserrez la vis de la borne, insérez les fils dénudés dans la borne puis resserrez la vis à fond.
- Acheminez les fils à l'intérieur du couvercle pour éviter tout pincement. Fixez le couvercle à l'alimentation à l'aide des vis à tête cylindrique M3 x 8 mm fournies. Reportez-vous à la figure suivante.



1-Serre-câble assemblé

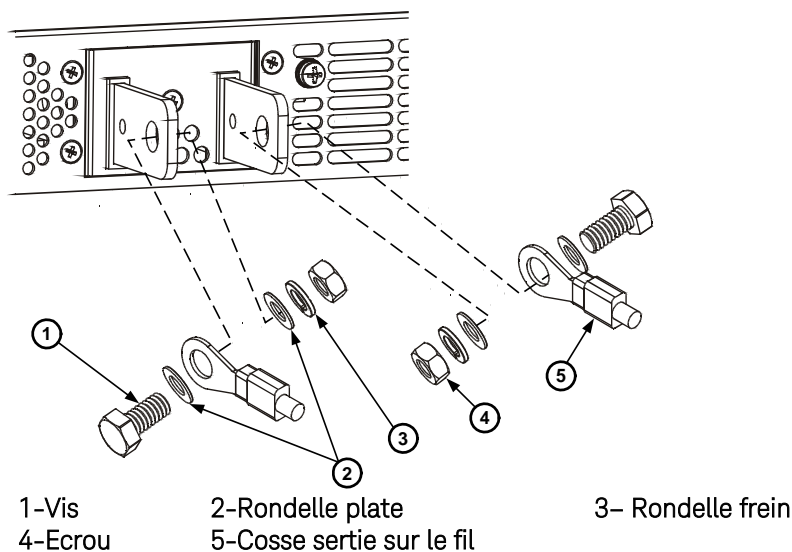
## Branchement de charge (alimentations 6 V à 60 V)

**AVERTISSEMENT** RISQUE D'ELECTROCUTION Interrompez l'alimentation secteur avant de réaliser les branchements sur la face arrière. Tous les fils et cavaliers doivent être correctement branchés, les vis étant serrées à fond.

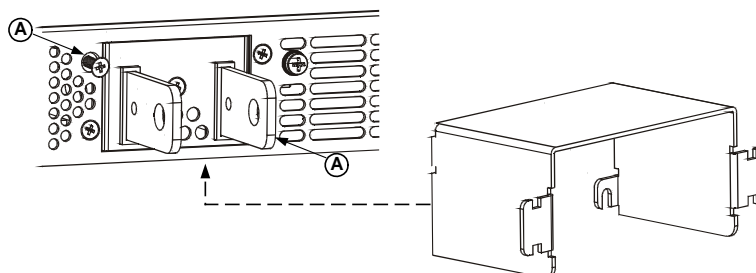
Afin de protéger le personnel de tout contact avec des tensions dangereuses, vérifiez que la charge et ses connexions ne présentent pas de parties sous tension accessibles. Vérifiez que l'isolation des fils de charge est égale ou supérieure à celle nécessaire pour la tension de sortie maximale de l'alimentation.

**ATTENTION** Vérifiez que le matériel de fixation ne court-circuite pas les bornes de sortie. Les câbles de connexions lourds doivent être munis de dispositifs réducteurs de contrainte pour éviter de desserrer les connexions ou de tordre les barres conductrices.

Comme le montre la figure suivante, tous les fils de charge doivent être munis de cosse solidement fixées aux bornes. N'utilisez pas de fils nus pour relier la charge à l'alimentation.



Montez le couvercle une fois que vous avez terminé le branchement des fils de charge. Fixez le couvercle avec les vis de châssis A.



## Branchement de charge (alimentations 80 V à 600 V)

### AVERTISSEMENT

RISQUE D'ELECTROCUTION Interrompez l'alimentation secteur avant de réaliser les branchements sur la face arrière. Tous les fils et cavaliers doivent être correctement branchés, les vis étant serrées à fond.

Afin de protéger le personnel de tout contact avec des tensions dangereuses, vérifiez que la charge et ses connexions ne présentent pas de partie sous tension accessible et que l'isolement des fils de charge est égal ou supérieur à celui nécessaire pour la tension de sortie maximale de l'alimentation.

---

Les modèles 80 V à 600 V sont équipés d'un connecteur de sortie par bornier à quatre bornes. Les deux bornes de gauche correspondent au pôle positif et les deux bornes de droite au pôle négatif. Les spécifications du connecteur sont les suivantes :

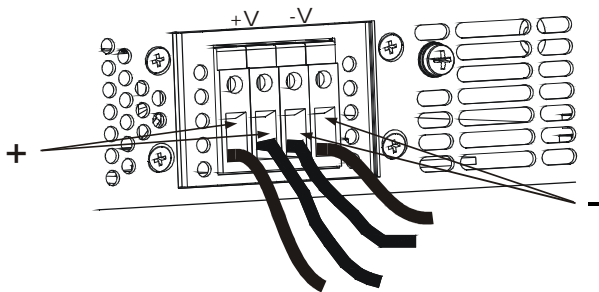
**Section des fils :** 0,78 mm<sup>2</sup> à 5,26 mm<sup>2</sup>

**Longueur dénudée :** 10 mm

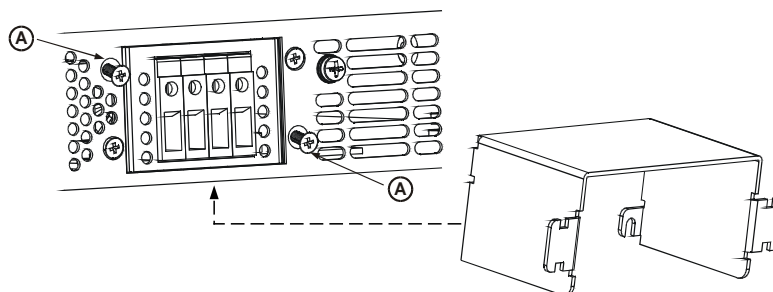
**Couple :** 0,73-0,79 Nm

Branchez les fils de charge à l'alimentation comme suit :

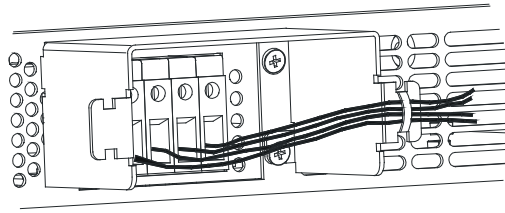
- Dénudez les fils sur 10 mm approximativement.
- Desserrez les vis des bornes du connecteur et insérez les fils dénudés dans les bornes. Serrez à fond les vis des bornes.



- Desserrez à moitié les deux vis de châssis marquées A.
- Fixez le couvercle de protection en resserrant les deux vis sur le châssis.



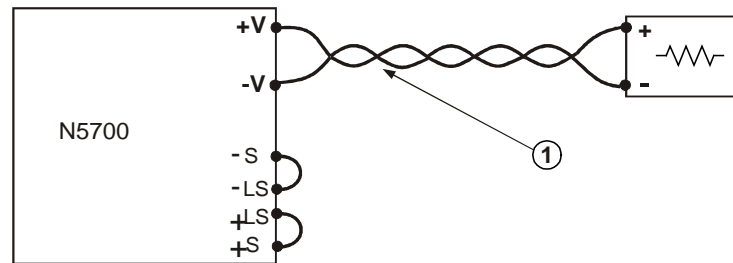
- Fixez les fils à l'un des côtés du couvercle à l'aide d'un collier serre-câble ou équivalent. Vérifiez que la longueur des fils est suffisante dans le couvercle pour soulager la traction.



## Régulation de la tension de sortie

### Régulation locale

L'alimentation est livrée avec le connecteur de régulation J2 de face arrière câblé pour la régulation locale de la tension de sortie (reportez-vous à la page 9). Dans ce cas, la régulation de la tension de sortie s'effectue directement au niveau des bornes de sortie. La régulation locale n'est recommandée que si le courant de charge est faible ou la régulation par rapport à la charge peu critique.

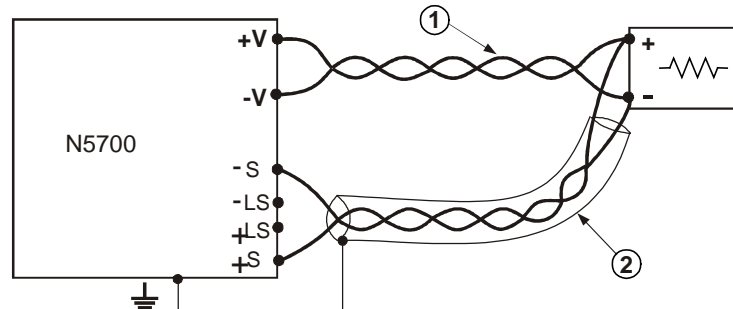


1 –Fils de charge. Paire torsadée ; aussi courte que possible.

### Régulation à distance

Utilisez la régulation à distance si la régulation de charge est critique au niveau de charge. Elle permet à l'alimentation de compenser automatiquement la chute de tension des fils de charge.

Utilisez des fils torsadés ou blindés pour réduire le bruit capté. Si des fils blindés sont utilisés, connectez le blindage à la masse en un seul point, au châssis de l'alimentation ou à la masse de charge.



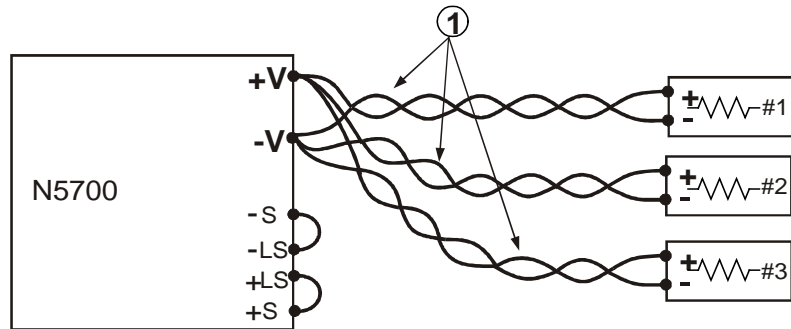
1 –Fils de charge. Paire torsadée ; aussi courte que possible.

2 –Fils de régulation. Paire torsadée ou fils blindés.

# Considérations relatives à la charge

## Charges multiples

La figure suivante représente plusieurs charges connectées à une seule alimentation. Chaque charge doit être connectée à la sortie de l'alimentation via une paire de fils distincte. Il est recommandé que chaque paire de fils soit aussi courte que possible et torsadée ou blindée pour réduire le captage et le rayonnement de bruit.

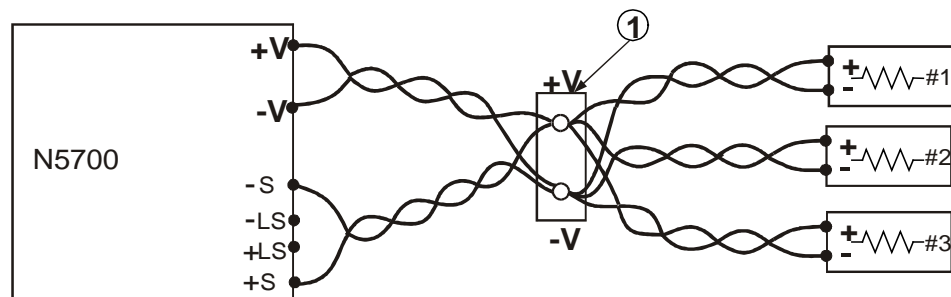


1 -Fils de charge. Paire torsadée ; aussi courte que possible.

Si des bornes de distribution à distance sont utilisées, comme le montre la figure suivante, les bornes de sortie de l'alimentation doivent être reliées aux bornes de distribution à distance à l'aide d'une paire de fils torsadés ou blindés. Branchez séparément chaque charge aux bornes de distribution. La régulation à distance de la tension est recommandée dans ces circonstances.

## Charges inductives

Les charges inductives peuvent produire des pointes de tension dommageables à l'alimentation. Une diode doit être connectée aux bornes de sortie. La tension et le courant admissibles dans la diode doivent être supérieurs à la tension et au courant de sortie de l'alimentation. Connectez la cathode de la diode au pôle positif et son anode au pôle négatif de l'alimentation.



1-Borne de distribution.

## Mise à la terre de la sortie

La sortie de l'alimentation est isolée de la terre. Toutefois, des tensions positives ou négatives peuvent être obtenues à la sortie en mettant à la terre une des bornes de sortie. Utilisez toujours deux fils pour relier la charge à la sortie, quel que soit le lieu ou le style de mise à la terre du système. Pour éviter les problèmes de bruit, mettez à la terre la borne de sortie aussi prêt que possible de la masse du châssis de l'alimentation.

### AVERTISSEMENT RISQUE D'ELECTROCUTION

Pour les modèles dont la tension nominale de sortie est inférieure à 60 V CC, aucun point de la sortie ne doit être à plus de  $\pm 60$  V CC au-dessus ou en-dessous de la masse du châssis.

Pour les modèles dont la tension nominale de sortie est supérieure à 60 V CC, aucun point du pôle positif ne doit être à plus de  $\pm 600$  V CC au-dessus ou en-dessous de la masse du châssis.

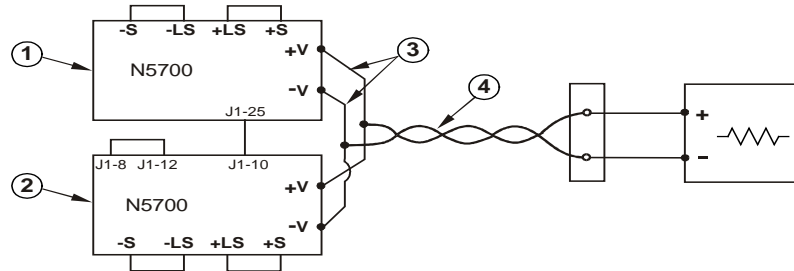
Pour les modèles dont la tension nominale de sortie est supérieure à 60 V CC, aucun point du pôle négatif ne doit être à plus de  $\pm 400$  V CC au-dessus ou en-dessous de la masse du châssis.

## Connexions en parallèle

**ATTENTION** Seules des alimentations dont les valeurs nominales de tension et de courant sont équivalentes peuvent être connectées en parallèle.

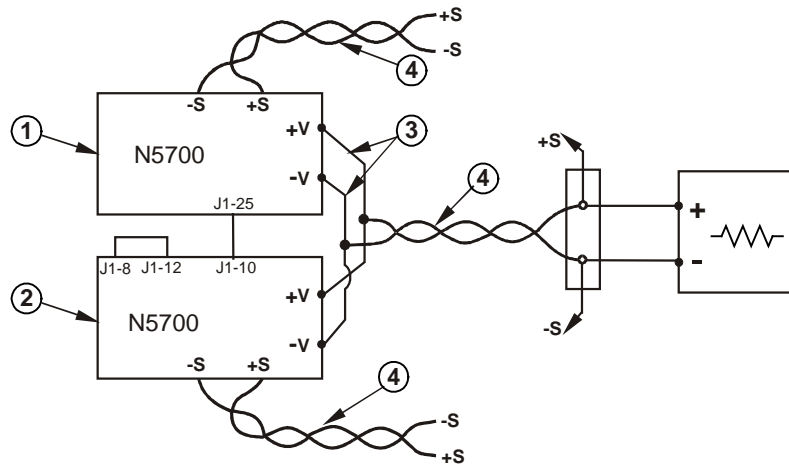
Jusqu'à quatre alimentations de même valeur nominale de tension et de courant peuvent être connectées en parallèle et fournir jusqu'à quatre fois le courant disponible sur une seule alimentation. Les figures suivantes représentent deux alimentations. Toutefois la même méthode de connexion est possible pour quatre alimentations.

Une des alimentations est maître et les autres sont esclaves. Les alimentations esclaves fonctionnent comme des sources de courant contrôlées suivant le courant de sortie de l'alimentation maître. A distance, seule l'alimentation maître peut être programmée par l'ordinateur. La liaison des alimentations esclaves à l'ordinateur ne sert qu'à la lecture de la tension, du courant et de leur état.



### Régulation locale

1-Alimentation maître. 2-Alimentation esclave. 3-Aussi court que possible.  
4-Paire torsadée.



Régulation à distance

1-Alimentation maître. 2-Alimentation esclave.  
3-Aussi court que possible. 4-Paire torsadée.

## Réglage de l'alimentation maître

Connectez le circuit de régulation locale ou à distance comme dans les figures précédentes. Réglez la tension de sortie de l'alimentation maître à la valeur désirée. Programmez le courant à la valeur limite totale du courant désiré dans la charge divisée par le nombre d'alimentations connectées en parallèle. L'alimentation maître fonctionne alors en mode de tension constante, régulant la tension aux bornes de charge à la valeur programmée.

## Réglage des alimentations esclaves

Réglez l'interrupteur 2 du commutateur de configuration SW1 de la face arrière en position haute. Reliez la broche 10 (programmation du courant) du connecteur J1 de l'alimentation esclave à la broche 25 (parallèle) du connecteur J1 de l'alimentation maître. Connectez également un court-circuit entre la broche J1 8 et la broche J1 12. La tension de sortie des alimentations esclaves doit être supérieure à celle de l'alimentation maître pour éviter une interférence avec la commande de cette alimentation maître. Programmez la limite du courant de chaque alimentation à la valeur limite totale du courant désiré dans la charge divisée par le nombre d'alimentations connectées en parallèle.

## Réglage de la protection contre les surtensions et les surintensités

Programmez la protection contre les surtensions de l'alimentation maître au niveau désiré. Programmez le niveau de surtension des alimentations esclaves à une valeur supérieure à celle de l'alimentation maître. Si l'alimentation maître se coupe, elle programme la tension de sortie des alimentations esclaves à zéro.

Si vous le désirez, la protection contre les surintensités ne peut être utilisée qu'avec l'alimentation maître. Si celle-ci se coupe, elle programme la tension de sortie de l'alimentation esclave à zéro.

## Connexions en série

### AVERTISSEMENT RISQUE D'ELECTROCUTION

Pour les modèles dont la tension nominale de sortie est inférieure à 60 V CC, aucun point de la sortie ne doit être à plus de  $\pm 60$  V CC au-dessus ou en-dessous de la masse du châssis.

Pour les modèles dont la tension nominale de sortie est supérieure à 60 V CC, aucun point du pôle positif ne doit être à plus de  $\pm 600$  V CC au-dessus ou en-dessous de la masse du châssis.

Pour les modèles dont la tension nominale de sortie est supérieure à 60 V CC, aucun point du pôle négatif ne doit être à plus de  $\pm 400$  V CC au-dessus ou en-dessous de la masse du châssis.

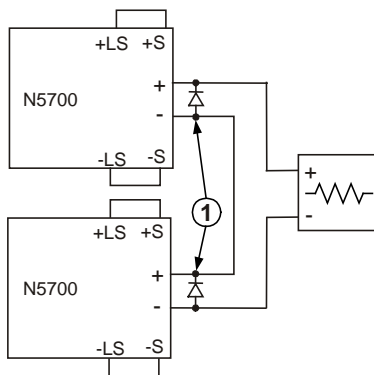
### ATTENTION

Seules des alimentations dont les valeurs nominales de tension et de courant sont équivalentes peuvent être connectées en série.

Deux alimentations de même valeur nominale de tension et de courant peuvent être connectées en série pour doubler la tension de sortie disponible. Parce que le courant est identique dans chaque élément d'un circuit en série, les sorties connectées en série **DOIVENT** avoir des valeurs nominales de courant équivalentes.

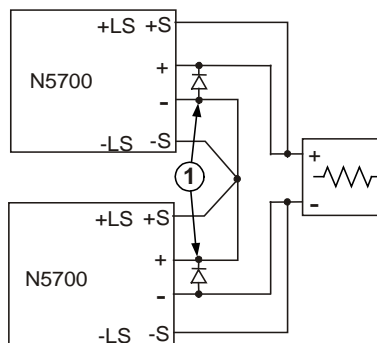
Il est recommandé de connecter des diodes en parallèle avec chaque sortie pour éviter une tension inverse lors de la séquence de démarrage ou si l'une des alimentations s'interrompt. Chaque diode devra supporter au moins la valeur nominale de la tension et du courant de l'alimentation.

Les figures suivantes illustrent des connexions en série avec régulation locale et à distance, et un schéma d'alimentations connectées en série configurées pour obtenir une tension positive et une tension négative.

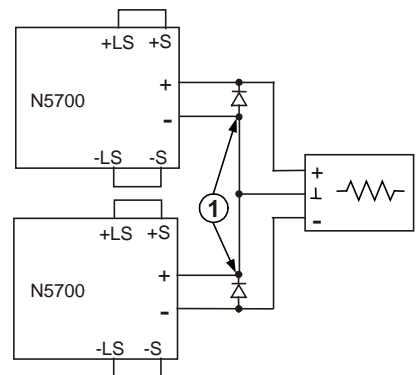


Régulation locale

1-L'utilisateur doit fournir les diodes.



Régulation à distance



Tension positive et tension négative



## Fonctionnement normal

### Mode de tension constante

En mode de tension constante, l'alimentation régule la tension de sortie à la valeur sélectionnée, alors que le courant de charge varie selon la valeur de celle-ci. Si l'alimentation fonctionne en mode de tension constante, le voyant CV s'allume sur la face avant.

Si la sortie est activée, tournez le bouton VOLTAGE pour programmer la tension de sortie. Si la sortie est désactivée, appuyez sur le bouton LIMIT puis tournez 1VOLTAGE. L'écran DC VOLTS affiche la tension programmée pendant 5 secondes puis OFF.

Le bouton VOLTAGE peut se régler avec une résolution grossière ou fine. Appuyez sur le bouton FINE pour sélectionner la résolution fine. Le voyant FINE s'allume.

#### REMARQUE

Si vous ne pouvez pas régler la tension de sortie à la valeur désirée, l'alimentation fonctionne peut-être à sa limite de courant. Vérifiez la condition de charge et la limite du courant. Le réglage de la tension maximale et minimale peut aussi être limité par les réglages de protection contre les surtensions et de limite de sous-tension.

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### Mode de courant constant

En mode de courant constant, l'alimentation régule le courant de sortie à la valeur sélectionnée, alors que la tension varie selon la valeur requise par la charge. Si l'alimentation fonctionne en mode de courant constant, le voyant CC s'allume sur la face avant.

Si la sortie est activée et en mode de courant constant, tournez le bouton CURRENT pour programmer la limite. Si la sortie est en mode de courant constant, appuyez sur le bouton LIMIT puis tournez le bouton CURRENT. L'écran DC AMPS affiche le courant programmé pendant 5 secondes puis le courant de sortie réel.

Si la sortie est désactivée, appuyez sur le bouton LIMIT puis tournez le bouton CURRENT. L'écran DC AMPS affiche le courant programmé pendant 5 secondes puis s'éteint, la sortie étant désactivée.

Le bouton CURRENT peut se régler avec une résolution grossière ou fine. Appuyez sur le bouton FINE pour sélectionner la résolution fine. Le voyant FINE s'allume.

### Basculement entre les modes CV et CC

Le mode dans lequel fonctionne l'alimentation dépend du réglage de la tension, du réglage de la limite du courant et de la résistance de charge. Si l'alimentation fonctionne en mode de tension constante et si le courant de charge augmente au dessus du réglage de limite du courant, l'alimentation bascule en mode de courant constant. Si le courant de charge redevient inférieur à la limite du courant, l'alimentation repasse en mode de tension constante.

## Signal CV/CC

### ATTENTION

Ne branchez pas le signal CV/CC à une source de tension supérieure à 30 V CC. Branchez toujours le signal CV/CC à la source de tension avec une résistance en série afin de limiter le courant absorbé à 10 mA.

---

Le signal CV/CC disponible sur le connecteur J1 indique le mode de fonctionnement de l'alimentation. Le signal CV/CC est une sortie à collecteur ouvert avec une diode zéner de 30 V en parallèle sur la broche 13 de J1 et le commun de référence de la broche 12 de J1. Cette broche est connectée de manière interne à la borne -S. Si l'alimentation fonctionne en mode de tension constante, la sortie CV/CC est en circuit ouvert. Si l'alimentation fonctionne en mode de courant constant, le signal CV/CC est à l'état bas (0-0,6 V), avec un courant absorbé maximal de 10 mA.

## Fonctions de protection

### Protection contre les surtensions

La protection contre les surtensions coupe la sortie de l'alimentation si la tension de sortie dépasse la limite définie par le réglage OVP.

Pour régler la limite OVP, appuyez sur le bouton OVP/UVL de sorte que l'écran indique OUP. L'écran affiche le réglage OVP. Tournez le bouton VOLTAGE pour régler la limite OVP. L'écran affiche OVP et la valeur de réglage pendant 5 secondes de plus, puis revient à son état précédent. Si une condition de surtension se produit, la sortie est désactivée, l'écran affiche OVP et le voyant PROT clignote.

### Limite de sous-tension

La limite de sous-tension empêche le réglage de la tension de sortie en dessous d'une certaine limite.

Le réglage UVL peut se réaliser si la sortie est activée ou désactivée. Pour régler la limite UVL, appuyez deux fois sur le bouton OVP/UVL de sorte que l'écran indique UUL. L'écran affiche le réglage UVL. Tournez le bouton VOLTAGE pour régler la limite UVL. L'écran affiche UUL et la valeur de réglage pendant 5 secondes de plus, puis revient à son état précédent.

### Protection contre les surintensités

La protection contre les surintensités coupe la sortie de l'alimentation si le courant de sortie dépasse la limite définie par le réglage de courant.

Pour l'armer, appuyez sur le bouton OCP/488 afin que le voyant OCP s'allume. Si cette protection est armée, une transition entre le mode de tension constante et le mode de courant constant l'active. Si un événement de protection contre les surintensités se produit, la sortie est désactivée, l'écran affiche OCP et le voyant PROT clignote.

## Protection contre les températures excessives

La protection contre les températures excessives coupe la sortie de l'alimentation si sa température interne devient trop élevée. Si une condition OTP se produit, la sortie est désactivée, l'écran affiche O7P et le voyant PROT clignote.

## Verrouillage de la face avant

Les commandes de la face avant peuvent être verrouillées afin d'empêcher toute modification accidentelle des réglages. Maintenez le bouton LIMIT enfoncé pour passer du verrouillage au déverrouillage. L'écran affiche LFP (verrouillage) ou UFP (déverrouillage). Si l'on relâche le bouton LIMIT, le mode correspondant à celui affiché est sélectionné.

**En mode déverrouillé**, les commandes de la face avant sont activées pour programmer et surveiller les paramètres d'alimentation.

**En mode verrouillé**, les boutons VOLTAGE, CURRENT, OCP/488 et OUT ON sont désactivés. L'écran affiche LFP pour indiquer que la face avant est verrouillée. Le bouton OVP/UVL reste actif pour prévisualiser les réglages OVP et UVL. Le bouton LIMIT reste également actif pour prévisualiser les réglages de la tension et du courant de sortie ou pour déverrouiller la face avant.

## Commandes d'activation/de désactivation de la sortie

### Bouton OUT ON

Le bouton OUT ON active/désactive la sortie. Si elle est désactivée, la tension et le courant de sortie sont nuls et l'écran affiche OFF.

### Bornes de coupure de la sortie

Les bornes de coupure de la sortie (SO) sont disponibles sur le connecteur J1 pour activer/désactiver la sortie de l'alimentation. Cette fonction est déclenchable sur des fronts. La broche 15 de J1 est l'entrée de coupure ; les broches 2 et 3, reliées en interne, sont le commun du signal. Toutes les broches sont isolées de la sortie par photocoupleur. L'entrée de coupure accepte un signal compris entre 2,5 V et 15 V ou un contact de type circuit ouvert/court-circuit pour activer/désactiver la sortie. La polarité logique est définie par l'interrupteur 5 du commutateur de configuration SW1.

Si une transition activation vers désactivation est détectée à l'entrée de coupure, la fonction de coupure active ou désactive la sortie selon le niveau du signal ou le circuit ouvert/court-circuit appliqué à la broche 15 de J1. Si la sortie est désactivée par la fonction de coupure, l'écran affiche SO pour indiquer cette désactivation.

Interrupteur 5 de SW1	Niveau du signal SO (coupure)	Sortie	Affichage
Position basse (défaut)	2 - 15 V ou circuit ouvert	Activée	Tension/courant
	0-0,4 V ou court-circuit	Désactivée	SO
Position haute	2 - 15 V ou circuit ouvert	Désactivée	SO
	0-0,4 V ou court-circuit	Activée	Tension/courant

## Bornes d'activation/désactivation

**ATTENTION** Afin d'éviter tout dommage possible à l'alimentation, ne connectez pas les bornes Enable + et Enable – aux bornes de sortie positive et négative.

Ces bornes sont disponibles sur le connecteur J1 pour activer/désactiver la sortie de l'alimentation. Cette fonction est déclenchable sur des niveaux : il suffit de brancher un commutateur ou un relais entre les broches J1 1 et 14 . Elle est activée par l'interrupteur 9 du commutateur de configuration SW1.

Ces broches désactivent la sortie lorsqu'elles sont en circuit ouvert. Si la sortie est désactivée, le voyant PROT de la face avant clignote.

Interrupteur 9 de SW1	Broches ENA+/ENA–	Sortie	Affichage	Voyant Port
Position basse (défaut)	Non actives	Activée	Tension/courant	Eteint
Position haute	En circuit ouvert	Désactivée	ENA	Clignotant
	En court-circuit	Activée	Tension/courant	Eteint

## Signal de bon fonctionnement de l'alimentation

Le signal de bon fonctionnement de l'alimentation du connecteur J1 indique une anomalie dans l'alimentation. La broche 16 de J1 délivre un signal de sortie TTL. Les broches 2 et 3 reliées en interne constituent le commun du signal. Toutes les broches sont isolées par photocoupleur de la sortie de l'alimentation. S'il n'y a pas d'anomalie, le signal de bon fonctionnement de l'alimentation est au niveau haut avec un courant de source maximal de 2 mA. En cas d'anomalie, le signal est au niveau bas avec un courant absorbé maximal de 1 mA. Ces anomalies mettent le signal au niveau bas :

Protection contre les surtensions	Signal d'activation/désactivation vrai
Protection contre les surintensités	Signal de coupure vrai
Protection contre les températures excessives	Panne d'interface
Panne d'alimentation secteur	Sortie désactivée

## Démarrage de sécurité et redémarrage automatique

L'alimentation peut être programmée pour que, à sa mise sous tension, elle retrouve ses derniers réglages opérationnels (Safe-Start) ou réinitialisés (Auto-Restart). Maintenez le bouton OUT ON enfoncé pour passer de l'un à l'autre. L'écran affiche SAF ou AUT toutes les 3 secondes. Si l'on relâche le bouton OUT ON, le mode correspondant à celui affiché est sélectionné.

**En démarrage de sécurité**, les réglages de l'alimentation sont réinitialisés. La sortie est désactivée ; la tension et le courant de sortie sont nuls.

**En redémarrage automatique**, l'alimentation restaure les paramètres opérationnels à sa dernière extinction (consultez la liste suivante). La sortie est activée/désactivée selon la dernière configuration.

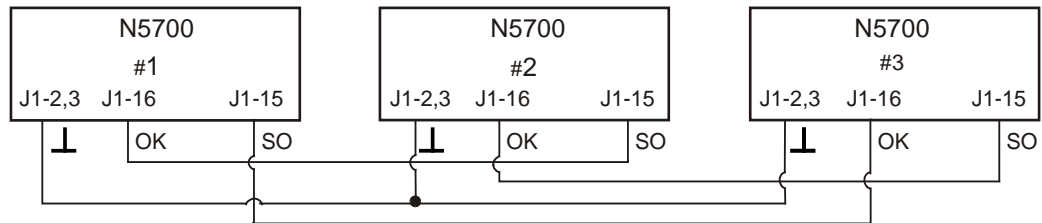
Sortie activée/désactivée  
 Réglage de la tension de sortie  
 Réglage du courant de sortie  
 Niveau OVP

Limite de sous-tension  
 Réglage OCP  
 Face avant verrouillée/déverrouillée  
 Mode de démarrage

## Coupure de plusieurs alimentations

Il est possible de configurer un système à plusieurs alimentations de sorte qu'elles s'arrêtent toutes si une anomalie survient sur l'une d'elles. L'interrupteur 5 du commutateur de configuration SW1 doit être en position basse pour permettre la coupure simultanée de plusieurs alimentations. Les autres interrupteurs ne sont pas concernés par ce réglage.

Si une anomalie se produit sur une alimentation, son signal de bon fonctionnement passe à l'état bas et son écran indique l'anomalie. Les autres alimentations s'arrêtent et leurs écrans indiquent SO. Si l'anomalie disparaît, toutes les alimentations retrouvent leur état initial selon leurs réglages de démarrage de sécurité ou de redémarrage automatique.



## Programmation analogique de la tension et du courant de sortie

### Bornes de contrôle de programmation analogique

La broche 8 du connecteur J1 accepte un signal TTL ou un commutateur à contacts travail/repos (référéncé par rapport à la broche 12) pour sélectionner la programmation locale ou analogique de la tension et du courant de sortie. Cette fonction est activée ou désactivée par les interrupteurs 1 et 2 du commutateur de configuration SW1.

La broche 21 du connecteur J1 est une sortie à collecteur ouvert qui indique si l'alimentation est en mode de programmation locale ou en mode de programmation analogique. Pour utiliser cette sortie, connectez une résistance de maintien à une source de tension de 30 V CC au maximum. Choisissez cette résistance de sorte que le courant absorbé soit inférieur à 5 mA si la sortie est à l'état bas.

Interrupteurs 1 et 2	Broche 8 de J1 - fonction	Broche 21 de J1 - signal	Tension/courant de sortie - commande
Les deux en position basse (défaut)	Aucun effet	Ouvert	Locale
Un ou les deux en position haute	0 ou court-circuit	0~0,6 V	Analogique
	1 ou ouvert	Ouvert	Locale

## Programmation de la tension et du courant de sortie par une tension

### ATTENTION

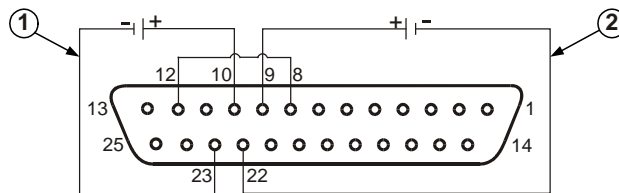
Les broches 12, 22 et 23 de J1 sont connectées en interne à la borne de régulation négative. Ne référencez pas ces broches à toute autre borne que celle de régulation négative, car cela peut endommager l'alimentation.

Pour conserver l'isolement de l'alimentation et d'éviter les boucles de masse, utilisez une source de programmation isolée si vous faites fonctionner l'alimentation à l'aide de la programmation analogique.

Des sources de tension de programmation de 0-5 V ou 0-10 V peuvent être utilisées pour programmer la tension de sortie et la limite de courant entre zéro et la pleine échelle. Positionnez l'interrupteur 3 de SW1 pour sélectionner la plage de tension de programmation selon le tableau suivant. Vérifiez que les interrupteurs 1 et 2 de SW1 sont en position HAUTE, et que les interrupteurs 7 et 8 sont en position BASSE.

Interrupteur 3 de SW1	Programmation de la tension (broche 9 de J1)	Programmation du courant (broche 10 de J1)
Position basse (défaut)	0-5 V	0-5 V
Position haute	0-10 V	0-10 V

Branchez la source de programmation au connecteur J1 comme le montre la figure suivante. Respectez la polarité de la source de tension. Reliez également ensemble les broches 8 et 12 de J1.



- 1-Programmation de la limite du courant.
- 2-Programmation de la tension de sortie.

## Programmation de la tension et du courant de sortie par une résistance

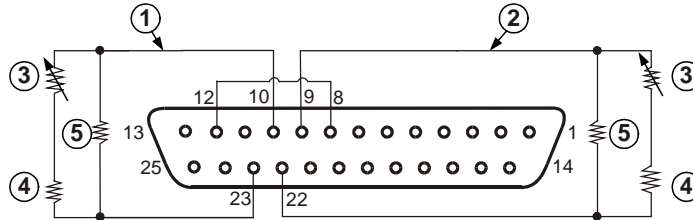
### ATTENTION

Les broches 12, 22 et 23 de J1 sont connectées en interne à la borne de régulation négative. Ne référencez pas ces broches à toute autre borne que celle de régulation négative, car cela peut endommager l'alimentation.

Des résistances de 0-5 k $\Omega$  ou 0-10 k $\Omega$  peuvent être utilisées pour programmer la tension de sortie et la limite de courant entre zéro et la pleine échelle. N'utilisez que des résistances stables et à faible bruit, avec un coefficient de température inférieur à 50 ppm. Positionnez l'interrupteur 3 de SW1 pour sélectionner la plage de résistance de programmation selon le tableau suivant. Vérifiez que les interrupteurs 1, 2, 7 et 8 de SW1 sont tous en position HAUTE.

Interrupteur 3 de SW1	Programmation de la tension (broche 9 de J1)	Programmation du courant (broche 10 de J1)
Position basse (défaut)	0-5 k $\Omega$	0-5 k $\Omega$
Position haute	0-10 k $\Omega$	0-10 k $\Omega$

Branchez les résistances de programmation au connecteur J1 comme le montre la figure suivante. Une résistance variable peut contrôler la sortie sur la totalité de sa plage. Une combinaison d'une résistance variable et de résistances en série/parallèle peut contrôler la sortie sur une portion restreinte de cette plage. Reliez également ensemble les broches 8 et 12 de J1.



- 1-Programmation de la limite du courant.
- 2-Programmation de la tension de sortie.
- 3-Résistance de programmation.
- 4-Résistance facultative, règle la limite inférieure.
- 5-Résistance facultative, règle la limite supérieure.

## Surveillance externe de la tension et du courant de sortie

Le connecteur J1 délivre aussi des signaux analogiques pour surveiller la tension et le courant de sortie. La sélection de la plage de tension entre 0–5 V ou 0–10 V est réalisée par l'interrupteur 4 de SW1. Les signaux de surveillance représentent 0 à 100 % de la tension et du courant nominal de sortie de l'alimentation. Les sorties de surveillance ont une résistance de sortie en série de 500  $\Omega$ . Assurez-vous que le circuit de mesure a une résistance en entrée supérieure à 500 k $\Omega$ , sinon la précision est réduite.

Interrupteur 4 de SW1	Plage de tension	Connexion du signal sur J1	Fonction du signal
Position basse (défaut)	0-5 V	Broche 11 de J1	Surveillance de la tension
		Broche 24 de J1	Surveillance du courant
Position haute	0-10 V	Broche 11 de J1	Surveillance de la tension
		Broche 24 de J1	Surveillance du courant

La broche 12 de J1 est le commun du signal pour les broches 11 et 24 de J1.

## Configuration et utilisation des interfaces de commande à distance

Le système d'alimentation CC Keysight N5700 accepte la communication par interface de commande à distance à l'aide de trois interfaces au choix : GPIB, USB et LAN. Les trois interfaces sont actives dès la mise sous tension. Pour de plus amples informations concernant la configuration et l'utilisation des interfaces de commande à distance, reportez-vous au guide d'utilisation (*User's Guide*) livré avec votre instrument.



Ces informations sont sujettes à modification sans préavis.  
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Novembre 2014  
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Keysight Technologies

システムDC電源

N5700シリーズ

クイック・リファ  
レンス・ガイド



## 安全に関する注意事項

本器の操作のあらゆる段階において、下記の安全に関する一般的な注意事項を遵守する必要があります。これらの注意事項や、本書の他の個所に記載されている個別の警告や指示を守らない場合、本器の設計、製造、および想定される用途に関する安全標準に違反します。Keysight Technologies は、お客様がこれらの要件を満たさなかった場合について、いかなる責任も負いません。

### 一般

製造者が指定した以外の方法で本製品を使用しないでください。操作説明書に記載されている以外の方法で本製品を使用した場合、本製品の保護機能が損なわれるおそれがあります。

### 電源を投入する前に

安全に関する注意事項がすべて守られていることを確認してください。本器への接続はすべて電源を投入する前に行ってください。「安全記号」の項に記載された本器外部のマーキングに注意してください。

### 機器のアース

本製品は安全クラス1の機器(感電防止用アース端子を装備)です。感電の危険を避けるため、本器のシャーシとカバーを電気的アースに接続する必要があります。本器をAC電源に接続するにはアース線付きの電源ケーブルを使用し、アース線を電源コンセントの電気的アース(感電防止用アース)端子にしっかりと接続してください。感電防止用(アース)線が切れているか、感電防止用アース端子が接続されていない場合、感電事故のおそれがあります。

### ヒューズ

本器には内部ヒューズが装備されています。お客様がヒューズを交換することはできません。

### 爆発のおそれがある環境で使用しないこと

可燃性のガスや蒸気が存在する環境で本器を使用しないでください。

### カバーを開けないこと

本器のカバーを開けることができるのは、危険について認識している有資格のサービスマンだけです。本器のカバーを開ける際には、必ず電源ケーブルや外部回路を切り離してください。

### 改造しないこと

本製品の部品を交換したり、無許可の改造を行ったりすることはおやめください。安全機能を維持するため、サービスや修理の際はKeysight営業所まで本製品をお送りください。

### 損傷の際には

本器に損傷または欠陥が認められる場合、ただちに使用をやめ、誤って使用されないよう必要な措置を講じた上で、有資格のサービスマンに修理を依頼してください。





















### 注意

**注意**の指示は危険を表します。ここに記載された操作手順、心得などを正しく実行または遵守しない場合、製品の損傷や重要なデータの損失を招くおそれがあります。記載された指示を十分に理解し、それが守られていることを確認しない限り、**注意**の指示より先に進まないでください。

### 警告

**警告**の指示は危険を表します。ここに記載された操作手順、心得などを正しく実行または遵守しない場合、怪我や人命の損失を招くおそれがあります。記載された指示を十分に理解し、それが守られていることを確認しない限り、**警告**の指示より先に進まないでください。

## 安全記号

	直流
	交流
	直流と交流
	3相交流
	アース(グラウンド)端子
	感電防止用アース端子
	フレームまたはシャーシ端子
	アース電位の端子
	常時設置されている機器のニュートラル導線
	常時設置されている機器のライン導線
	電源オン
	電源オフ
	電源スタンバイ。スイッチをオフにしても、本器はAC電源から完全には切り離されません。
	双安定プッシュ・スイッチの入位置
	双安定プッシュ・スイッチの切位置
	注意、感電の危険あり
	注意、表面が高温になる
	注意、説明書を参照
	注意、説明書を参照
	家庭ゴミとして廃棄しないこと

## 法的注意事項

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本書の内容は「現状のまま」で提供されており、将来の版では予告なしに変更される可能性があります。また、該当する法律の許す限りにおいて、本書およびそのすべての内容について、Keysightは明示、暗黙を問わずいかなる保証もいたしません。特に、商品性および特定目的への適合性に関する保証はありません。本書の内容の誤り、および本書の使用に伴う偶然、必然を問わずあらゆる損害に対して、Keysightは責任を負いません。Keysightとユーザとの間に本書の内容を対象とした保証に関する書面による契約が別に存在し、その内容がここに記す条件と矛盾する場合は、別契約の保証条件が優先するものとします。

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## Keysight N5700 DC電源システムの概要

Keysight N5700シリーズシステムDC電源は、広範囲の出力電圧および電流定格に対応した汎用スイッチング電源です。

これらの電源は力率補正されており、世界各地のAC電源レンジで動作します。出力電圧および電流の値が常時表示され、LEDインジケータによって電源の動作状態が一目でわかります。

フロントパネル・コントロールにより、出力パラメータ、過電圧、不足電圧、過電流保護レベルを設定し、設定を確認することができます。

リアパネルには、アナログ信号または内蔵リモート通信インターフェースを使って電源動作の制御とモニタを行うためのコネクタが用意されています。

### 出力機能

- 自動クロスオーバー付きの定電圧/定電流機能
- 高分解能の電圧/電流フロントパネル・コントロール
- 正確な電圧/電流リードバック
- 独立したエッジ・トリガ外部シャットオフ、およびレベル・トリガ外部オン/オフ
- アクティブ電流共有による並列マスタ/スレーブ動作
- リモート・センシングにより負荷リードによる電圧降下を補正
- アナログ出力プログラミングおよびモニタリング

### システム機能

- 内蔵GBIB/LAN/USBインターフェース
- 内蔵Webサーバにより、コンピュータ上のインターネット・ブラウザから本器を直接制御可能
- 隙間なしにスタック可能—電源の上面と下面に通気穴を持たない設計
- アクティブ力率補正付きのユニバーサル入力電圧
- ファン速度の制御により騒音低下とファン寿命の延長を実現

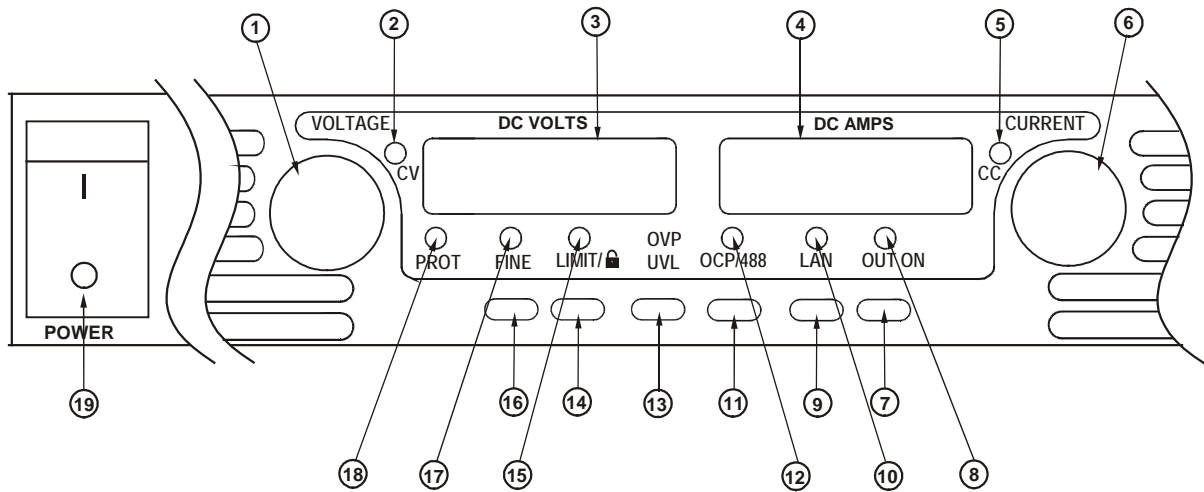
## プログラマブル機能

- 出力電圧および電流設定
- 出力電圧および電流測定
- 出力電圧および電流トリガ設定
- 出力オン/オフ制御
- 過電流保護設定
- 過電圧保護設定およびリードバック
- 不足電圧制限値設定およびリードバック
- 起動モード(前回の設定またはリセット・モード)
- ステータス・レジスタ設定およびリードバック
- バス・トリガ
- 校正

## モデル定格

モデル	電圧レンジ	電流レンジ	モデル	電圧レンジ	電流レンジ
N5741A	0 – 6V	0 – 100A	N5761A	0 – 6V	0 – 180A
N5742A	0 – 8V	0 – 90A	N5762A	0 – 8V	0 – 165A
N5743A	0 – 12.5V	0 – 60A	N5763A	0 – 12.5V	0 – 120A
N5744A	0 – 20V	0 – 38A	N5764A	0 – 20V	0 – 76A
N5745A	0 – 30V	0 – 25A	N5765A	0 – 30V	0 – 50A
N5746A	0 – 40V	0 – 19A	N5766A	0 – 40V	0 – 38A
N5747A	0 – 60V	0 – 12.5A	N5767A	0 – 60V	0 – 25A
N5748A	0 – 80V	0 – 9.5A	N5768A	0 – 80V	0 – 19A
N5749A	0 – 100V	0 – 7.5A	N5769A	0 – 100V	0 – 15A
N5750A	0 – 150V	0 – 5A	N5770A	0 – 150V	0 – 10A
N5751A	0 – 300V	0 – 2.5A	N5771A	0 – 300V	0 – 5A
N5752A	0 – 600V	0 – 1.3A	N5772A	0 – 600V	0 – 2.5A

## フロントパネルの概要



### 1 - 電圧ノブ

**電圧機能:** 出力電圧、過電圧保護レベル、不足電圧制限値を調整します。過電圧保護または不足電圧制限値が設定されている場合、これらの制限値を超える出力電圧をプログラムすることはできません。

**GPIBアドレス:** OCP/488を押し続けると、GPIBアドレスを選択できます。

### 2 - CVインジケータ

これが点灯している場合、定電圧モードで動作していることを示します。出力電圧が一定に維持されます。

### 3 - DC電圧表示

このLEDディスプレイには、通常はセンス端子で測定された電圧が表示されます。LIMITを押しした場合、プログラムされている電圧設定が表示されます。OVP/UVLを押しした場合、過電圧または不足電圧設定が表示されます。OCP/488を押し続けた場合、GPIBアドレスが表示されます。LANを押し続けた場合、IPアドレスとイーサネット・アドレスが表示されます。

### 4 - DC電流表示

このLEDディスプレイには、通常は出力端子で測定された電流が表示されます。LIMITを押しした場合、プログラムされている電流設定が表示されます。LANを押し続けた場合、IPアドレスとイーサネット・アドレスが表示されます。

### 5 - CCインジケータ

これが点灯している場合、定電流モードで動作していることを示します。出力電流が一定に維持されます。

### 6 - 電流ノブ

出力電流を調整します。

### 7 - 出力オン・ボタン

**出力機能:** OUT ONを押すと、出力をオン/オフできます。OVPまたはOCPイベントが発生したあとでOUT ONを押すと、出力をリセットしてオンにすることができます。

**起動機能:** セーフ・スタート・モードと自動リスタート・モードを切り替えます。OUT ONボタンを押し続けると、セーフ・スタート・モードと自動リスタート・モードを切り替えることができます。ディスプレイには、SAF(セーフ・スタート)とAU7(自動リスタート)が交互に表示されます。どちらかのモードが表示されているときにOUT ONボタンを放すと、そのモードが選択されます。

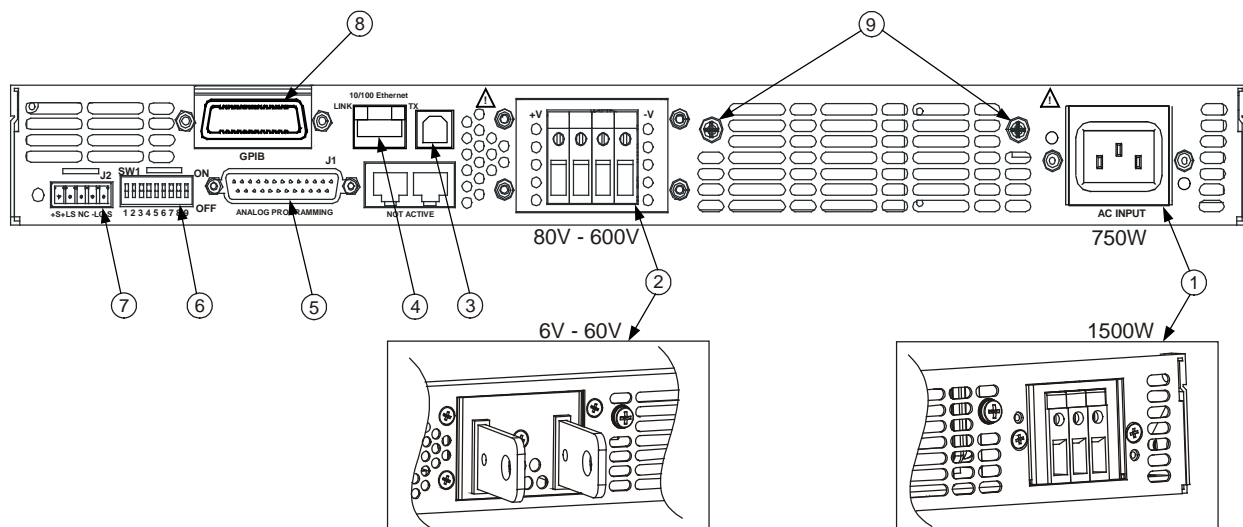
### 8 - 出力オン・インジケータ

これが点灯している場合、出力がオンになっていることを示します。

- 9 – LANボタン**      アドレスを表示: LANを押すと、IPアドレスとイーサネット・アドレスが表示されます。ディスプレイに、最初にIPアドレスの4つのセグメント、その後イーサネット (EA) アドレスの6つのセグメントがスクロール表示されます。アドレス表示をオフにするには、どれかのキーを押します。
- アドレスをリセット: LANボタンを3秒間押し続けます。“LAN rES”というメッセージが表示されている間にもう一度LANボタンを押すと、LAN設定が工場設定にリセットされます。設定の詳細については『ユーザーズ・ガイド』を参照してください。
- 10 – LANインジケータ**      これが点灯している場合、LANが設定され、正常に動作していることを示します。点滅している場合、機器のWebホーム・ページでインジケータが点滅するように設定された機器を示します。
- 11 – OCP/488ボタン**      OCPオン: OCP/488を押すと、過電流保護がオンになります。OCP/488をもう一度押すと、過電流保護がオフになります。
- OCPリセット: 過電流保護イベントが発生した場合、OUT ONボタンを押すと、出力をオンにして、過電流保護を再びアーミング状態にすることができます。
- GPIOアドレス: OCP/488ボタンを3秒間押し続けます。これにより、電圧ノブを使ってGPIOアドレスを設定できます。
- 12 – 過電流保護インジケータ**      これが点灯している場合、過電流保護がオンになっていることを示します。
- 13 – 過電圧保護/不足電圧制限値ボタン**      過電圧保護機能: OVP/UVLを1回押すと、電圧ノブで過電圧保護レベルを設定できるようになります(ディスプレイにはOUPと表示されます)。過電圧保護レベルは、現在の出力電圧設定よりも約5%以上高い値に設定する必要があります。
- 不足電圧制限値機能: OVP/UVLを2回押すと、電圧ノブで不足電圧プログラミング制限値を設定できるようになります(ディスプレイにはUULと表示されます)。不足電圧保護レベルは、現在の出力電圧設定よりも約5%以上小さい値に設定する必要があります。
- 14 – 制限値ボタン**      制限値機能: LIMITを押すと、出力電圧および電流の制限値が表示されます。これらの設定はディスプレイに5秒間表示され、その後表示は実際の出力電圧および電流に戻ります。
- ロック機能: LIMITボタンを押し続けると、フロントパネルのロックとロック解除を切り替えることができます。ディスプレイには、LFP(ロック)とUFP(ロック解除)が交互に表示されます。どちらかのモードが表示されているときにLIMITボタンを放すと、そのモードが選択されます。ディスプレイにrLFPが表示されている場合、フロント・パネルがリモート・プログラミング・コマンドによってロックされています。
- 15 – 制限値インジケータ**      これが点灯している場合、LIMITボタンが押されていることを示します。
- 16 – 微調整ボタン**      微調整または粗調整のコントロールを選択します。微調整モードでは、電圧ノブと電流ノブは高い分解能で動作します。粗調整モードでは、低い分解能で動作します(約6回転)。
- 17 – 微調整インジケータ**      これが点灯している場合、本器が微調整モードになっていることを示します。
- 18 – 保護インジケータ**      これが点滅している場合、異常が発生したことを示します。PROTインジケータが点滅する原因としては、OVP、OCP、OTP、イネーブル・フェール、ACフェール検出があります。本器をオフにした後、PROTインジケータが数秒間点滅し、ディスプレイにACと表示されることがあります。これは、本器内部の残留エネルギーが原因です。
- 19 – 電源スイッチ**      電源をオン/オフします。



## リアパネルの概要



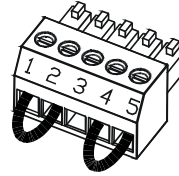
- |                       |   |
|-----------------------|---|
| 1 – AC入力コネクタ          | 1500 W出力モデルの場合はワイヤ・クランプ・コネクタ。<br>750 W出力モデルの場合はIECコネクタ。   |
| 2 – DC出力コネクタ          | 80 V～600 Vモデルの場合はワイヤ・クランプ・コネクタ。<br>6 V～60 Vモデルの場合はバス・バー。  |
| 3 – USBコネクタ           | USBインタフェースに接続するためのコネクタ。   |
| 4 – LANコネクタ           | LANインタフェースに接続するためのコネクタ。LINK LEDはリンクが正常かどうかを示します。TX LEDはLANの動作を示します。LANセットアップの詳細については『ユーザーズ・ガイド』を参照してください。               |
| 5 – アナログ・プログラミング・コネクタ | アナログ・インタフェース用コネクタ。出力電圧/電流制限値のプログラミングと信号のモニタ、シャットオフ制御(電気信号)、オン/オフ制御(ドライ接点)、電源OK信号および動作モード(CV/CC)信号が用意されています(詳細は次ページを参照)。 |
| 6 – SW1セットアップ・スイッチ    | 9位置のスイッチで、出力電圧、電流制限値、およびその他の制御機能のリモート・プログラミング/モニタ・モードの選択に使用します(詳細は次ページを参照)。   |
| 7 – リモート・センス・コネクタ     | 負荷電圧のレギュレーションとワイヤ電圧降下の補正のためのリモート・センス接続に使用するコネクタ(詳細は次ページを参照)。  |
| 8 – GPIBコネクタ          | GPIBインタフェースに接続するためのコネクタ。  |
| 9 – グランドねじ            | シャーシ・グランド接続のためのM4x8ねじ。  |

### 警告

**感電の危険: 電源コードにはシャーシ・グランドのための線があります。電源コンセントは必ず3極タイプを使用し、アースピンを正しくアースに接続してください。**

## J2センス・コネクタ

- 1 - リモート・センス(+)
- 2 - ローカル・センス(+)
- 3 - 未使用
- 4 - ローカル・センス(-)
- 5 - リモート・センス(-)



プラグの種類: MC 1.5/5-ST-3.81、Phoenix  
ワイヤ径: AWG 28~AWG 16  
ストリップ長さ: 7 mm  
トルク: 0.22~0.25 Nm

この図は出荷時の構成を示しています。

## SW1セットアップ・スイッチ

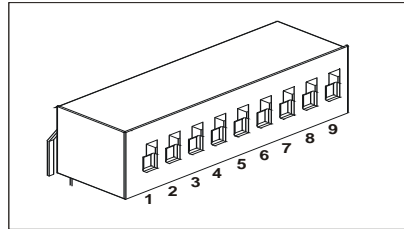
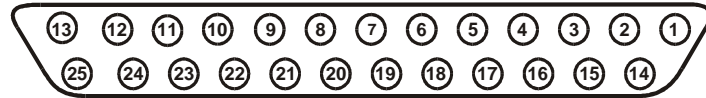


Fig.4-3: SW1 setup DIP switch  
出荷時の設定は全スイッチが下位置です。

- |                            |  |
|----------------------------|--|
| 1 - 出力電圧、電圧<br>プログラミング     | <u>下</u> : 出力電圧はフロントパネルからプログラムします。<br><u>上</u> : 出力電圧は外部電圧信号によってプログラムします。  |
| 2 - 出力電流、電圧<br>プログラミング     | <u>下</u> : 出力電流はフロントパネルからプログラムします。<br><u>上</u> : 出力電流は外部電圧信号によってプログラムします。  |
| 3 - プログラミング・レンジ<br>(電圧/抵抗) | <u>下</u> : リモート・プログラミング・レンジは次のとおり: 0~5 V/0~5 kΩ<br><u>上</u> : リモート・プログラミング・レンジは次のとおり: 0~10 V/0~10 kΩ                         |
| 4 - 電圧および電流<br>モニタリング・レンジ  | <u>下</u> : リモート・モニタリング・レンジは次のとおり: 0~5 V<br><u>上</u> : リモート・プログラミング・レンジは次のとおり: 0~10 V   |
| 5 - シャットオフ・ロジック選択          | <u>下</u> : OUT OFF=ロー(0~0.6 V)または短絡、OUT ON=ハイ(2 V~15 V)または開放<br><u>上</u> : OUT OFF=ハイ(2 V~15 V)または開放、OUT ON=ロー(0~0.6 V)または短絡 |
| 6 - 未使用                    |  |
| 7 - 出力電圧、抵抗<br>プログラミング     | <u>下</u> : 出力電圧はフロントパネルからプログラムします。<br><u>上</u> : 出力電圧は外部抵抗によってプログラムします。  |
| 8 - 出力電流、抵抗<br>プログラミング     | <u>下</u> : 出力電流はフロントパネルからプログラムします。<br><u>上</u> : 出力電流は外部抵抗によってプログラムします。  |
| 9 - オン/オフ制御                | <u>下</u> : J1 オン+/オン-ピンは非アクティブ<br><u>上</u> : J1 オン+/オン-ピンはアクティブ  |

## J1アナログ・プログラミング・コネクタ



差込みプラグ:	AMPパーツ番号745211-2
ワイヤ径:	AWG 26~AWG 22
引抜き工具:	AMPパーツ番号91232-1または同等品

工場出荷時のデフォルト構成はローカル動作で、J1への接続を必要としません。

ピン 1:	オン入	ピン 1 をピン 14 に接続すると、出力がオンになります (接続を切り離すと出力がオフになります)。
ピン 2, 3:	シャーシ・コモン	ピン 15 とピン 16 の信号リターン (シャーシに接続)。
ピン 4~7:	未使用	接続なし
ピン 8:	ローカル/アナログ	出力のフロントパネル・プログラミングとアナログ・プログラミングを選択する入力。
ピン 9:	電圧プログラム	出力電圧の電圧または抵抗プログラミングのための入力。
ピン 10:	電流プログラム	出力電流の電圧または抵抗プログラミングのための入力。
ピン 11:	電圧モニタ	出力電圧をモニタするための出力。
ピン 12:	コモン	ピン 8、ピン 11、ピン 13、ピン 24 の信号リターン (-S 基準)。
ピン 13:	CV/CC	定電圧/定電流モードを示す出力。
ピン 14:	オン出	ピン 14 をピン 1 に接続すると、出力がオンになります (接続を切り離すと出力がオフになります)。
ピン 15:	シャットオフ	出力のシャットオフ制御のための入力 (シャーシ・コモン基準)。
ピン 16:	電源 OK	電源の状態を示す出力 (シャーシ・コモン基準)。
ピン 17~20:	未使用	接続なし
ピン 21:	ローカル/アナログ状態	ローカル・プログラミング・モードまたはアナログ・プログラミング・モードを示す出力。
ピン 22:	電圧プログラム・リターン	ピン 9 の信号リターン (内部でピン 12 に接続)。
ピン 23:	電流プログラム・リターン	ピン 10 の信号リターン (ピン 12 基準)。
ピン 24:	電流モニタ	出力電流をモニタするための出力。
ピン 25:	並列	並列動作での電流バランスのための出力。

## 機器のインストール

### 安全に関する考慮事項

本電源は安全クラス1の機器であり、感電防止用アース端子があります。この端子をアースに接続する必要があります。安全に関する一般情報については、本書冒頭の「安全に関する注意事項」を参照してください。

### 環境

#### 警告

可燃性のガスや蒸気のある環境で本器を使用しないでください。

#### 注意

本器前面の吸気口と背面の排気口をふさがないでください。

本器は屋内の制御された環境でのみ使用できます。温度が40°Cを超える環境で本器を使用しないでください。

本電源は、ファンによって前面から吸気し、背面から排気することによって冷却されます。本器をインストールする場所には、前面と背面に通気のために10 cm以上の空間が必要です。

### ラックへのインストール

Keysight N5700電源は、標準の19インチ・ラック・パネルまたはキャビネットにマウントできます。電源をラックにインストールする手順は以下のとおりです。

1. フロントパネルのラック・マウント用ブラケットを使って、本電源をラックにインストールします。
2. サポート・ブラケットを使って、本電源の背面に十分なサポートを実現します。
3. ラック・マウント・スライドを使用する場合、Keysight N5740Aラック・マウント・スライド・キットを使って、本器を標準の19インチ・ラックにインストールします。左右それぞれに、#10-32x9.7mm(最大)のインチねじを2個使用します。内部の損傷を避けるため、必ず指定された長さのねじを使用してください。

### 清掃

#### 警告

感電の危険：感電事故を防ぐため、清掃の前に本器の電源プラグをコンセントから抜いてください。

乾いた布または水でわずかに湿らせた布を使って、ケース外部のパーツを清掃します。内部の清掃はしないでください。

## 電源コードの接続

### 警告

感電の危険：電源コードにはシャーシ・グラウンドのための線があります。電源コンセントは必ず3極のものを使用し、正しいピンをアースに接続してください。

火災の危険：本器に付属の電源コード以外は使用しないでください。他の電源コードを使用すると、コードが過熱して火災の原因となるおそれがあります。

### 注記

取外し可能な電源コードは、非常時の断路装置として使用できます。電源コードを引き抜くと、本器へのAC電源入力が遮断されます。

本器背面のAC入力は、ユニバーサルAC入力です。85 Vac~265 Vacの範囲の電源電圧が使用できます。周波数レンジは47 Hz~63 Hzです。

750 Wモデルに必要な入力電流は、100 Vac定格で10.5 A、200 Vac定格で5 Aです。1500 Wモデルに必要な電流は、100 Vac定格で21 A、200 Vac定格で11 Aです。

### 750 Wモデルの入力接続

本器裏面のIEC 320コネクタに電源コードを接続します。IECコネクタには、感電防止用アースがあります。

機器に付属の電源コードが正しくない場合、計測お客様窓口までお知らせください。

### 1500 Wモデルの入力接続

### 注意

本電源をAC電源に接続する作業は、有資格者だけが行えます。

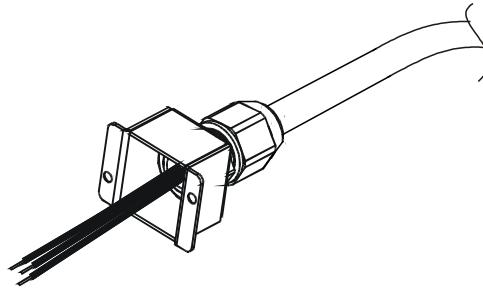
AC入力コネクタは3極のワイヤ・クランプで、リアパネルにあります。適合するワイヤと締め付けトルクを使用してください。

ワイヤ径: AWG 12またはAWG 10  
トルク: 6.5~7.0インチ・ポンド

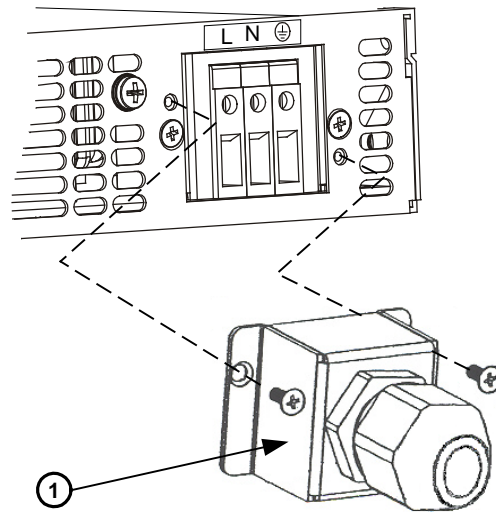
ケーブルを次のようにAC入力コネクタに接続します。

- ACケーブルの絶縁外被を約10 cm剥きます。グラウンド・ワイヤが他のワイヤよりも10 mm長くなるようにワイヤを切りそろえます。各ワイヤの先端を14 mm剥きます。

- 緩衝部の基部を回して本体から外します。AC入力カバーの外部開口部を通して基部を挿入し、ロックナットを内側から基部にしっかりとねじ止めます。



- 本体をACケーブルの方にすべらせませます。絶縁を剥いたワイヤを緩衝部の基部を通して挿入し、ケーブル外被が基部の端と揃うようにします。ケーブルをそのままの位置に保持しながら、本体を基部に固定します。
- ACワイヤを必要な入力コネクタ端子に接続します。ワイヤを接続するには、端子ねじを緩め、ワイヤの剥いた部分を端子に挿入し、ねじをしっかりと締めます。
- ワイヤが挟まれないようにカバー内部を通します。付属のM3 x 8平皿ねじを使ってカバーを本器に固定します。次の図を参照してください。



1- 緩衝部を組み立てたところ

## 負荷の接続(6 V～60 Vモデル)

### 警告

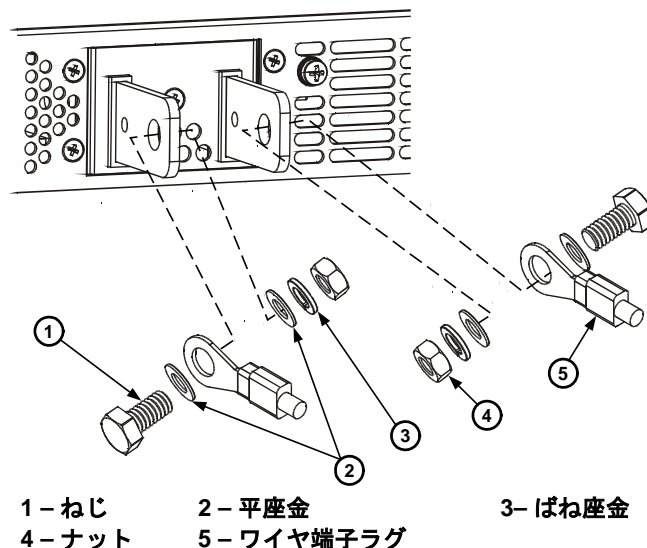
感電の危険：リアパネルに接続を行う際には、AC電源をオフにしてください。ワイヤとストラップは正しく接続し、ねじをしっかりと締めてください。

作業者が誤って危険な電圧に接触することがないように、負荷とその接続に触れられる通電部分がないことを確認してください。負荷配線の絶縁定格が、本電源の最大出力電圧以上であることを確認してください。

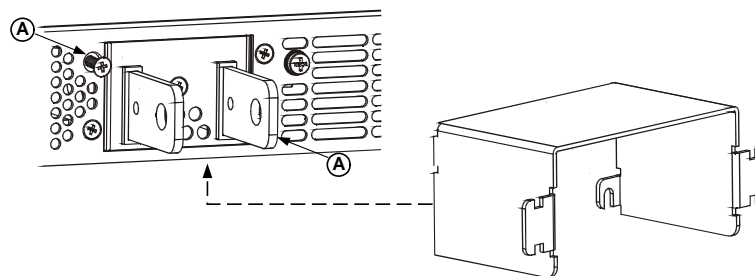
### 注意

取付け金具によって出力端子が短絡されないように注意してください。接続ケーブルが重い場合、接続が緩んだりバス・バーが曲がったりするのを防ぐために、何らかの緩衝部を使用してください。

次の図に示すように、すべての負荷ワイヤはワイヤ端子をしっかりと固定することにより正しく終端する必要があります。電源への負荷接続に未終端のワイヤを使用することは避けてください。



負荷ワイヤの接続が終了したら、シールドを固定します。Aという印の付いたシャーシねじでシールドを固定します。



## 負荷の接続(80 V～600 Vモデル)

### 警告

感電の危険：リアパネルに接続を行う際には、AC電源をオフにしてください。ワイヤとストラップは正しく接続し、ねじをしっかりと締めてください。

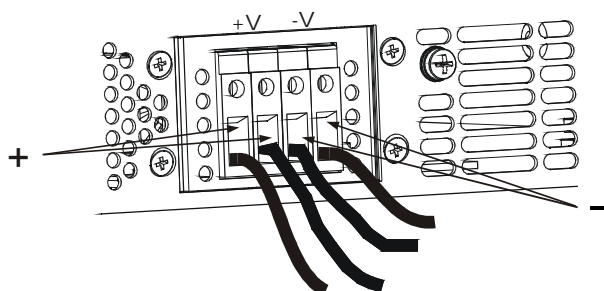
作業者が誤って危険な電圧に接触することがないように、負荷とその接続に触れられる通電部分がないことを確認してください。負荷配線の絶縁定格が、本電源の最大出力電圧以上であることを確認してください。

80 V～600 Vのモデルには、4端子ワイヤ・クランプ出力コネクタが装備されています。左の2つの端子が正の出力、右の2つの端子が負の出力です。コネクタの仕様は次のとおりです。

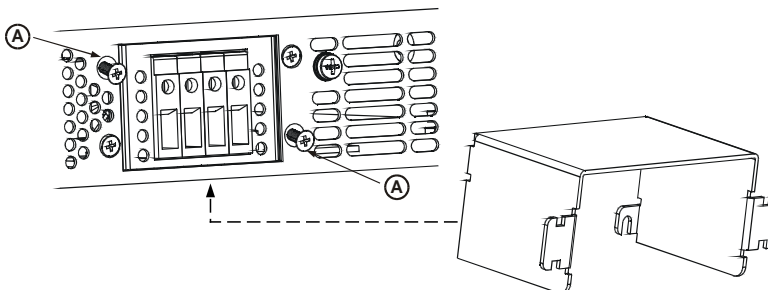
- ワイヤ径: AWG 18～AWG 10
- ストリップ長さ: 10 mm
- トルク: 6.5～7インチ・ポンド

負荷ワイヤを次のように本電源に接続します。

- ワイヤを約10 mm剥きます。
- コネクタ端子ねじを緩め、剥いたワイヤを端子に挿入します。端子ねじをしっかりと締めます。

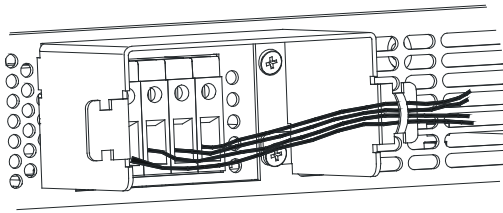


- Aという印の付いた2つのシャーシねじを半分まで緩めます。
- 保護シールドをシャーシに取り付け、2つのねじを締めてシールドをシャーシに固定します。





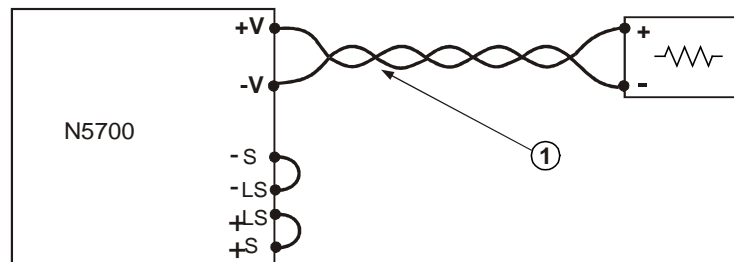
- タイラップなどを使って、ワイヤをシールドのどちらかの側に固定します。シールド内部のワイヤの長さが緩衝用に十分であることを確認してください。



## 出力電圧センシング

### ローカル・センシング

本電源はリアパネルにJ2センス・コネクタがあり、出力電圧のローカル・センシングに使用できます(9ページ参照)。ローカル・センシングでは、出力電圧のレギュレーションは出力端子で行われます。ローカル・センシングが推奨されるのは、負荷電流が小さい場合や、負荷による電源変動がそれほど重要でない場合です。

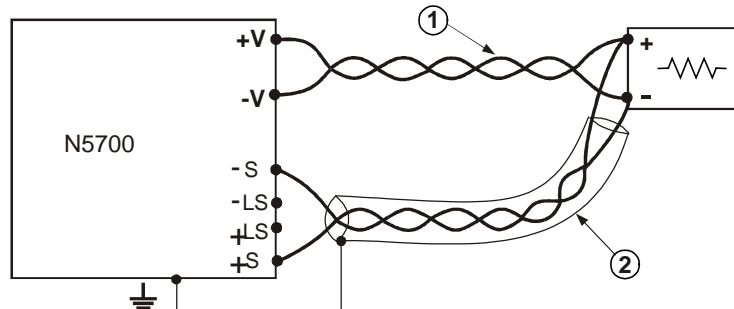


1- 負荷ラインツイスト・ペア : できるだけ短く

### リモート・センシング

リモート・センシングは、負荷による電源変動が重要なアプリケーションに使用します。リモート・センシングでは、負荷リードの電圧降下を電源が自動的に補正します。

ノイズの混入を最小にするため、ツイスト線またはシールド線を使用してください。シールド線を使用する場合、シールドは電源シャーシまたは負荷グラウンドのどちらか一方の点でグラウンドに接続します。

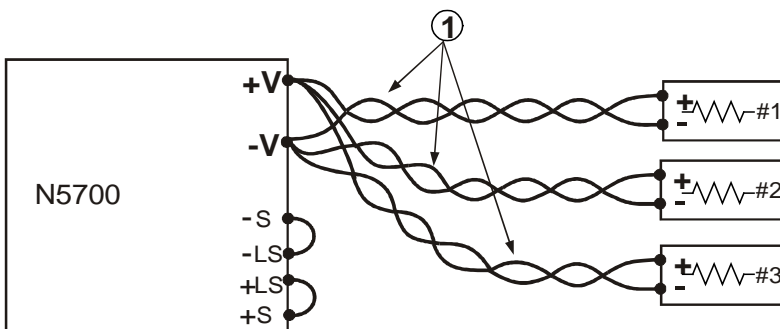


1- 負荷ラインツイスト・ペア : できるだけ短く  
2- センス・ラインツイスト・ペア/シールド線

## 負荷に関する考慮事項

### 複数の負荷

次の図は、1台の電源に複数の負荷を接続した例を示します。それぞれの負荷は、別々のワイヤ対を使って電源の出力端子に接続する必要があります。ノイズの混入と放射を最小にするため、それぞれのワイヤ対はできるだけ短くし、ツイスト線またはシールド線を使用します。

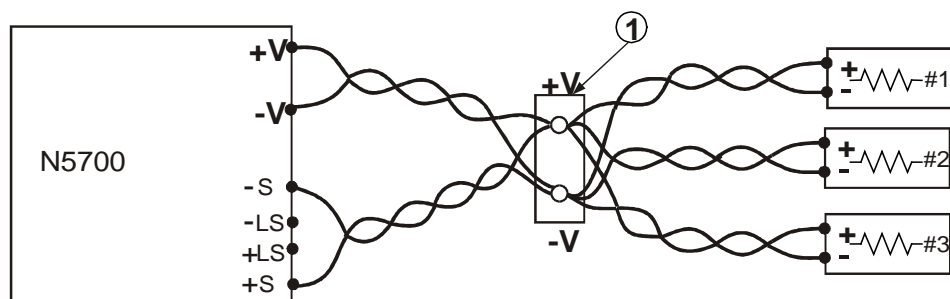


1- 負荷ラインツイスト・ペア：できるだけ短く

次の図のようにリモート分配端子を使用する場合、電源出力端子を1対のツイスト線またはシールド線でリモート分配端子に接続します。それぞれの負荷を分配端子に別々に接続します。このような場合は、リモート電圧センシングの使用を推奨します。

### 誘導性負荷

誘導性負荷からは、電源に有害な電圧スパイクが発生する場合があります。このため、電源出力にダイオードを接続する必要があります。ダイオードの電圧および電流定格は、電源の最大出力電圧および電流定格よりも大きくなければなりません。ダイオードのカソードを電源の正の出力、アノードを負の出力に接続します。



1- 分配端子

## 出力のグランド接続

電源の出力は、グランドからは分離されています。正と負のどちらかの電圧を出力から得るには、出力端子の1つをグランドに接続します。システムがどこでどのようにグランドに接続されているかに関わらず、負荷を出力に接続する場合は必ず2本の線を使用してください。ノイズの問題を避けるため、出力端子は電源のシャーシ・グランドのできるだけ近くでグランドに接続してください。

### 警告

#### 感電の危険

定格出力が60 Vdcまでのモデルでは、出力のすべてのポイントがシャーシ・グランドから±60 Vdc以内でなければなりません。

定格出力が60 Vdcより大きいモデルでは、正の出力のすべてのポイントがシャーシ・グランドから±600 Vdc以内でなければなりません。

定格出力が60 Vdcより大きいモデルでは、負の出力のすべてのポイントがシャーシ・グランドから±400 Vdc以内でなければなりません。

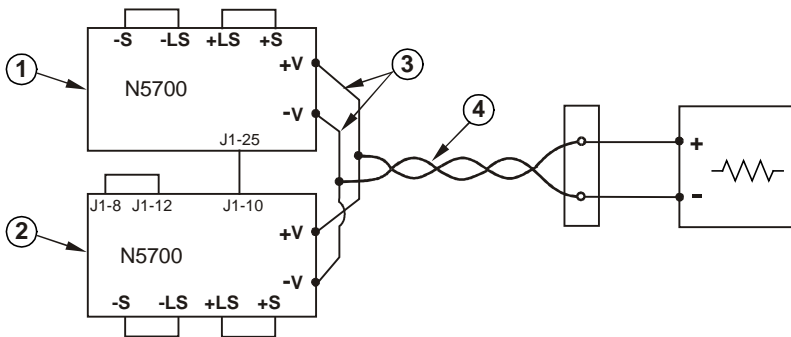
## 並列接続

### 注意

並列に接続できるのは、電圧および電流定格が等しい電源だけです。

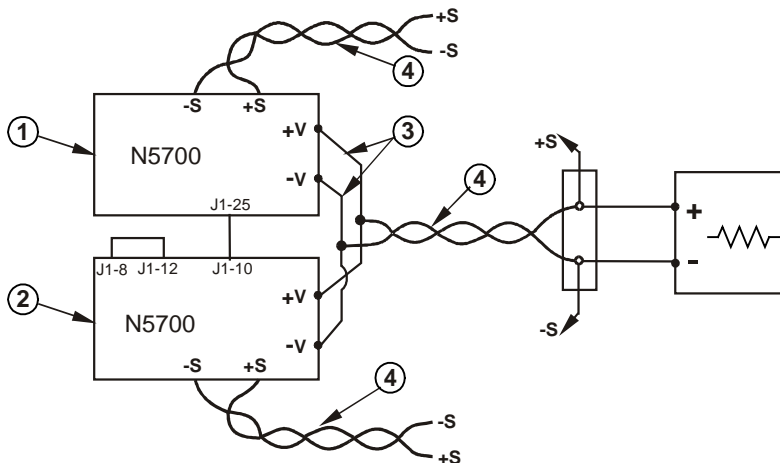
定格電圧および電流が一致する電源を4台まで並列に接続することにより、最大4倍の出力電流を得ることができます。次の図は2台の電源を接続した例ですが、同じ接続方式で4台までの電源を接続できます。

電源の1台がマスタ・ユニットとして動作し、残りの電源はスレーブ・ユニットとして動作します。スレーブ・ユニットは、マスタの出力電流に従う被制御電流源として動作します。リモート動作の場合、コンピュータからプログラムできるのはマスタ・ユニットだけで、スレーブ・ユニットは電圧、電流、ステータスのリードバック機能のためだけにコンピュータに接続できません。



#### ローカル・センシング

1-マスタ・ユニット 2-スレーブ・ユニット 3-できるだけ短く 4-ツイスト・ペア



リモート・センシング

1-マスタ・ユニット 2-スレーブ・ユニット 3-できるだけ短く 4-ツイスト・ペア

## マスタ・ユニットのセットアップ

これらの図で示すように、ローカル・センシングまたはリモート・センシング用のセンシング回路を接続します。マスタ・ユニットの出力電圧を必要な値に設定します。電流制限値を、必要な負荷電流制限値を並列ユニット数で割った値に設定します。動作中は、マスタ・ユニットは定電圧モードで動作し、プログラムされた出力電圧に負荷電圧を調整します。

## スレーブ・ユニットのセットアップ

リアパネルのセットアップ・スイッチSW1の位置2を上位置に設定します。スレーブ・ユニットのJ1ピン10(電流プログラム)をマスタ・ユニットのJ1ピン25(並列)に接続します。次に、J1ピン8とJ1ピン12を短絡します。スレーブ・ユニットの出力電圧は、マスタ・ユニットの制御に干渉するのを避けるため、マスタ・ユニットの出力電圧よりも高くプログラムしておく必要があります。各ユニットの電流制限値を、必要な電流制限値を並列ユニット数で割った値に設定します。

## 過電圧および過電流保護の設定

マスタ・ユニットの過電圧保護を必要なレベルに設定します。スレーブ・ユニットの過電圧レベルをマスタ・ユニットよりも大きい値に設定します。マスタ・ユニットがシャットダウンすると、スレーブ・ユニットが0出力電圧にプログラムされます。

必要な場合、過電流保護はマスタ・ユニットだけに使用できます。マスタ・ユニットがシャットダウンすると、スレーブ・ユニットが0出力電圧にプログラムされます。

## 直列接続

### 警告

#### 感電の危険

定格出力が60 Vdcまでのモデルでは、出力のすべてのポイントがシャーシ・グラウンドから $\pm 60$  Vdc以内でなければなりません。

定格出力が60 Vdcより大きいモデルでは、正の出力のすべてのポイントがシャーシ・グラウンドから $\pm 600$  Vdc以内でなければなりません。

定格出力が60 Vdcより大きいモデルでは、負の出力のすべてのポイントがシャーシ・グラウンドから $\pm 400$  Vdc以内でなければなりません。

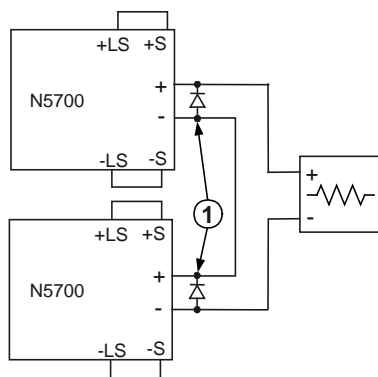
### 注意

直列に接続できるのは、電圧および電流定格が等しい電源だけです。

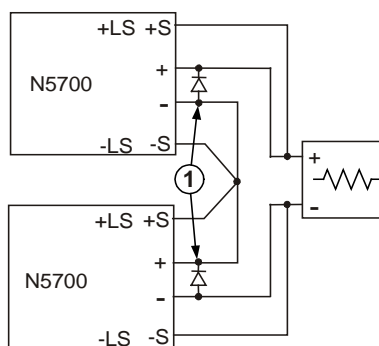
定格電圧および電流が一致する電源を2台直列に接続することにより、最大2倍の出力電圧を得ることができます。直列回路の各素子を流れる電流は等しいため、直列に接続する出力は**必ず**電流定格が一致しなければなりません。

起動シーケンス中や一方の電源がシャットダウンしたときの逆電圧を防止するため、各出力と並列にダイオードを接続することを推奨します。ダイオードの定格は、電源の定格出力電圧および電流以上でなければなりません。

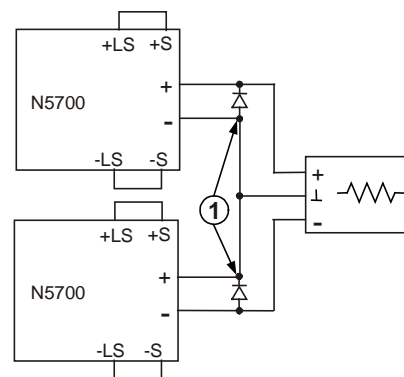
以下の図は、ローカル・センシングとリモート・センシングを使った直列接続を示します。また、直列接続した電源を正と負の出力として構成する例も示します。



ローカル・センシング



リモート・センシング



正と負の出力

1 - ダイオードはユーザが用意

## 通常動作

### 定電圧モード

定電圧モードでは、電源は出力電圧を選択した値に維持し、負荷電流は負荷の必要に応じて変化します。本電源が定電圧モードで動作している場合、フロントパネルのCVインジケータが点灯します。

出力がオンの場合、出力電圧をプログラムするには単に電圧ノブを回します。出力がオフの場合、LIMITボタンを押してから電圧ノブを回します。調整が終わると、DC VOLTSディスプレイにプログラムされた電圧が5秒間表示されたあと、OFFが表示されます。

電圧ノブは粗調整モードまたは微調整モードに設定できます。FINEボタンを押すと微調整モードになり、分解能が高まります。FINEインジケータが点灯します。

#### 注記

出力電圧を必要な値に調整できない場合、電源が電流制限値で動作している可能性があります。負荷条件と電流制限値設定を調べてください。また、過電圧保護と不足電圧制限値の設定によって、最大/最小電圧設定が制限されている可能性もあります。

### 定電流モード

定電流モードでは、電源は出力電流を選択した値に維持し、電圧は負荷の必要に応じて変化します。本電源が定電流モードで動作している場合、フロントパネルのCCインジケータが点灯します。

出力がオンで定電流モードの場合、電流制限値をプログラムするには単に電流ノブを回します。出力が定電圧モードの場合、LIMITボタンを押してから電流ノブを回します。調整が終わると、DC AMPSディスプレイにプログラムされた電流が5秒間表示されたあと、実際の出力電流が表示されます。

出力がオフの場合、LIMITボタンを押してから電流ノブを回します。調整が終わると、DC AMPSディスプレイにプログラムされた電流が5秒間表示されたあと、出力がオフなので空白表示になります。

電流ノブは粗調整モードまたは微調整モードに設定できます。FINEボタンを押すと微調整モードになり、分解能が高まります。FINEインジケータが点灯します。

### CV/CCモードのクロスオーバー

本電源が動作するモードは、電圧設定、電流制限値設定、負荷抵抗に依存します。定電圧モードのときに負荷電流が電流制限値設定を超えると、定電流モードに切り替わります。負荷電流が電流制限値を下回ると、定電圧モードに切り替わります。

## CV/CC信号

### 注意

CV/CC信号は、30 Vdcよりも高い電圧源に接続しないでください。CV/CC信号は、シンク電流を10 mA未満に制限するため、必ず直列抵抗とともに電圧源に接続してください。

J1コネクタのCV/CC信号は、電源の動作モードを示します。CV/CC信号はオープン・コレクタ出力で、J1ピン13に30 Vの並列ツェナーがあり、J1ピン12のコモンを基準としています。J1ピン12は内部で-S端子に接続されています。定電圧モード動作の場合、CV/CC出力はオープンです。定電流モード動作の場合、CV/CC信号出力はロー(0~0.6 V)であり、シンク電流は最大10 mAです。

## 保護機能

### 過電圧保護

過電圧保護は、出力電圧が過電圧保護(OVP)制限値設定を超えたときに電源出力をシャットダウンします。

OVPレベルを設定するには、OVP/UVLボタンを押し、ディスプレイにOUPと表示させます。ディスプレイにOVP設定が表示されます。電圧ノブを回してOVPレベルを調整します。ディスプレイにOVPと設定値が5秒間表示された後、元の状態に戻ります。過電圧条件が発生すると、出力がオフになり、ディスプレイにOVPと表示され、PROTインジケータが点滅します。

### 不足電圧制限値

不足電圧制限値は、出力電圧を特定の値より下に調整できないようにします。

不足電圧制限値(UVL)の設定は、出力がオンのときにもオフのときにも実行できます。UVLレベルを設定するには、OVP/UVLボタンを2回押し、ディスプレイにUULと表示させます。ディスプレイにUVL設定が表示されます。電圧ノブを回してUVLレベルを調整します。ディスプレイにUULと設定値が5秒間表示された後、元の状態に戻ります。

### 過電流保護

過電圧保護は、負荷電流が電流制限値設定を超えたときに電源出力をシャットダウンします。

過電流保護をアーミングするには、OCP/488ボタンを押し、OCPインジケータを点灯させます。過電流保護がアーミング状態になると、定電圧モードから定電流モードへの移行が発生したときに過電流保護が動作します。過電流保護イベントが発生すると、出力がオフになり、ディスプレイにOCPと表示され、PROTインジケータが点滅します。

## 過熱保護

過熱保護は、内部温度が高くなりすぎたときに出力をシャットダウンします。過熱条件が発生すると、出力がオフになり、ディスプレイにO7Pと表示され、PROTインジケータが点滅します。

## フロントパネルのロック機能

意図しない調整が行われないように、フロントパネルをロックすることができます。LIMITボタンを押し続けると、フロントパネルのロックとロック解除を切り替えることができます。ディスプレイには、LFP(ロック)とUFP(ロック解除)が交互に表示されます。どちらかのモードが表示されているときにLIMITボタンを放すと、そのモードが選択されます。

**ロック解除モード**では、フロントパネルが有効になり、電源パラメータのプログラムとモニタに使用できます。

**ロック・モード**では、電圧ノブと電流ノブ、OCP/488ボタン、OUT ONボタンが無効になります。ディスプレイにLFPと表示され、フロントパネルがロックされていることを示します。OVP/UVLボタンは有効のままであり、OVPおよびUVL設定を確認することができます。LIMITボタンも有効であり、出力電圧/電流設定の確認や、フロントパネルのロック解除に使用できます。

## 出力オン/オフ制御

### OUT ONボタン

OUT ONボタンは、出力をオン/オフします。オフにした場合、出力電圧と電流が0になり、ディスプレイにOFFと表示されます。

### 出力シャットオフ端子

出力シャットオフ(SO)端子はJ1コネクタにあり、電源出力をオン/オフするために使用できます。この機能はエッジ・トリガです。J1ピン15がシャットオフ入力であり、ピン2と3は内部で接続された信号コモンです。すべてのピンは光アイソレーションにより電源出力と分離されています。シャットオフ入力は、2.5 V~15 Vの信号または開放/短絡接点により、出力をオンまたはオフにします。シャットオフ制御のロジックは、SW1セットアップ・スイッチ5で選択します。

シャットオフ入力でオンからオフへの遷移が検出されると、J1ピン15に印加された信号レベルまたは開放/短絡に応じて、シャットオフ機能が出力をオンまたはオフにします。シャットダウン機能によって出力がオフになった場合、ディスプレイにSOと表示され、出力がオフになったことを示します。

SW1スイッチ5	SO信号レベル	出力	ディスプレイ
下(デフォルト)	2~15 Vまたは開放	オン	電圧/電流
	0~0.4 Vまたは短絡	オフ	SO
上	2~15 Vまたは開放	オフ	SO
	0~0.4 Vまたは短絡	オン	電圧/電流



## オン/オフ端子

### 注意

本器の損傷を避けるため、オン+またはオン-端子を正または負の出力端子に接続しないでください。

オン/オフ端子はJ1コネクタにあり、電源出力をオンまたはオフにします。この機能はレベル・トリガです。スイッチまたはリレーをJ1ピン1と14に接続します。この機能は、SW1セットアップ・スイッチ9によって有効になります。

これらのピンが開放状態になると、出力がオフになります。出力がオフになると、フロントパネルのPROTインジケータが点滅します。

SW1スイッチ9	オン+/オン-ピン	出力	ディスプレイ	PROT インジケータ
下(デフォルト)	非アクティブ	オン	電圧/電流	オフ
上	開放	オフ	ENA	点滅
	短絡	オン	電圧/電流	オフ

## 電源OK信号

J1コネクタの電源OK信号は、本電源のフォールト条件を示します。J1ピン16はTTL出力信号です。ピン2と3は、内部で接続された信号コモンです。すべてのピンは光アイソレーションにより電源出力と分離されています。フォールトがない状態では、電源OK信号はハイで、最大ソース電流は2 mAです。フォールトが発生した場合、電源OK信号はローで、最大シンク電流は1 mAです。以下のフォールトが発生したときに、この信号がローになります。

過電圧保護	オン/オフ信号が真
過電流保護	シャットオフ信号が真
過熱保護	インタフェース異常
AC電源異常	出力オフ

## セーフ・スタートと自動リスタート

本器は、電源をオンにしたときに前回の動作設定で起動するか(自動リスタート)、初期設定で起動するか(セーフ・スタート)を選択できます。OUT ONボタンを押し続けると、セーフ・スタート・モードと自動リスタート・モードを切り替えることができます。ディスプレイには、SAF(セーフ・スタート)とAUT(自動リスタート)が3秒ごとに交互に表示されます。どちらかのモードが表示されているときにOUT ONボタンを放すと、そのモードが選択されます。

**セーフ・スタート・モード**では、本器は初期設定で立ち上がります。出力はオフであり、出力電圧と電流はともに0です。

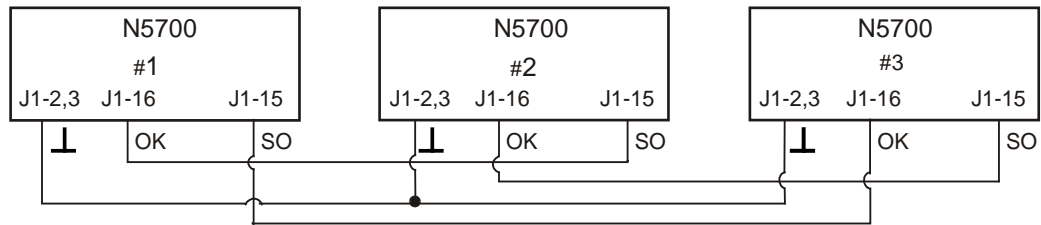
**自動リスタート・モード**では、電源をオフにしたときに動作設定が保存され、再びオンにしたときに復元されます(次のリストを参照)。出力は、前回の設定に応じてオンまたはオフになります。

出力オン/オフ状態	UVLレベル
出力電圧設定	OCP設定
出力電流設定	フロントパネルのロック/アンロック
OVPレベル:	起動モード

## 複数電源のシャットダウン

複線電源のシステムで、1つの電源にフォールト条件が発生したときに、すべての電源をシャットダウンするように設定できます。複数電源シャットダウンを使用するには、SW1セットアップ・スイッチ5が下の位置になっている必要があります。他のスイッチはこの設定に影響されません。

1台の電源でフォールトが発生すると、電源OK信号がローになり、ディスプレイにフォールトが表示されます。他の電源はオフになり、ディスプレイにSOと表示されます。フォールト条件がクリアされると、すべてのユニットがセーフ・スタートまたは自動リスタートの設定に基づいて再起動します。



## 出力電圧および電流のアナログ・プログラミング

### アナログ・プログラミング制御端子

J1コネクタのピン8は、TTL信号または開放/短絡(ピン12が基準)により、出力電圧および電流のローカル・プログラミングとアナログ・プログラミングを切り替えます。この機能は、SW1セットアップ・スイッチ1と2によって有効または無効になります。

J1コネクタのピン21は、オープン・コレクタ出力であり、本電源がローカル・モードとアナログ・モードのどちらであることを示します。この出力を使用するには、プルアップ抵抗を最大30 Vdcの電圧源に接続します。プルアップ抵抗は、出力がロー状態のときにシンク電流が5 mA未満となるように選択します。

SW1スイッチ1と2	J1ピン8機能	J1ピン21信号	出力電圧/電流制御
両方が下(デフォルト)	無効	開放	ローカル
1つまたは両方が上	0または短絡	0~0.6 V	アナログ
	1または開放	開放	ローカル

## 出力電圧および電流の電圧プログラミング

### 注意

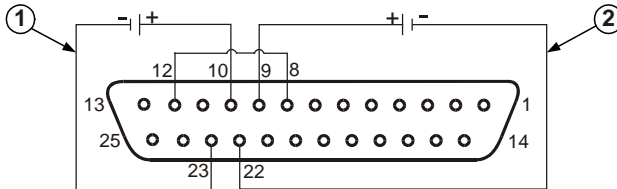
J1のピン12、ピン22、ピン23は、内部で負センス端子に接続されています。これらのピンの基準を負センス端子以外にすることは、本器を損傷するおそれがあるため避けてください。

電源のアイソレーションを保ち、グラウンド・ループを避けるため、アナログ・プログラミングで本器を操作するときには分離されたプログラミング・ソースを使用してください。

0~5 Vまたは0~10 Vの電圧プログラミング・ソースを使って、出力電圧および電流を0からフルスケールまでプログラムすることができます。SW1セットアップ・スイッチ3を設定して、次の表に基づいてプログラミング電圧レンジを選択します。SW1セットアップ・スイッチ1と2が上位置、スイッチ7と8が下位置にあることを確認してください。

SW1スイッチ3	電圧プログラム(J1ピン9)	電流プログラム(J1ピン10)
下(デフォルト)	0~5 V	0~5 V
上	0~10 V	0~10 V

次の図のように、プログラミング・ソースをJ1の差込みプラグに接続します。電圧源の極性が正しいことを確認してください。次に、J1ピン8とJ1ピン12を短絡します。



1 - 電流制限値プログラミング      2 - 出力電圧プログラミング

## 出力電圧および電流の抵抗プログラミング

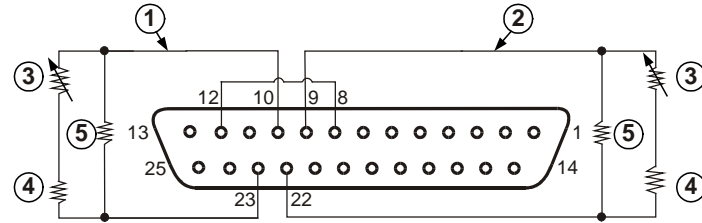
### 注意

J1のピン12、ピン22、ピン23は、内部で負センス端子に接続されています。これらのピンの基準を負センス端子以外にすることは、本器を損傷するおそれがあるため避けてください。

0~5 kΩまたは0~10 kΩの抵抗を使って、出力電圧および電流を0からフルスケールまでプログラムすることができます。使用する抵抗は安定した低雑音のもので、温度係数が50 ppm未満でなければなりません。SW1セットアップ・スイッチ3を設定して、次の表に基づいてプログラミング抵抗レンジを選択します。SW1セットアップ・スイッチ1、2、7、8がすべて上位置にあることを確認してください。

SW1スイッチ3	電圧プログラム(J1ピン9)	電流プログラム(J1ピン10)
下(デフォルト)	0~5 kΩ	0~5 kΩ
上	0~10 kΩ	0~10 kΩ

次の図のように、プログラミング抵抗をJ1の差込みプラグに接続します。可変抵抗を使ってレンジ全体で出力を制御することも、可変抵抗と直列/並列抵抗の組み合わせを使って、レンジの特定の部分だけで出力を制御することもできます。次に、J1ピン8とJ1ピン12を短絡します。



- 1- 電流制限値プログラミング      2- 出力電圧プログラミング  
 3- プログラミング抵抗            4- オプション、下限を設定  
 5- オプション、上限を設定

### 出力電圧および電流の外部モニタリング

J1コネクタには、出力電圧および電流をモニタするためのアナログ信号も用意されています。電圧レンジを0~5 Vと0~10 Vのどちらに設定するかは、SW1セットアップ・スイッチ4で選択します。モニタ信号は、本電源の出力電圧および電流定格の0~100%に対応します。モニタ出力には500 Ωの直列出力抵抗があります。センシング回路の入力抵抗は500 kΩより大きくしてください。そうでないと、確度が低下します。

SW1スイッチ4	電圧レンジ	J1信号接続	信号機能:
下(デフォルト)	0~5 V	J1ピン11	電圧モニタ
		J1ピン24	電流モニタ
上	0~10 V	J1ピン11	電圧モニタ
		J1ピン24	電流モニタ

J1ピン12は、J1ピン11と24の信号コモンです。

### リモート・インタフェースの構成と使用

Keysight N5700 DC電源は、 GPIB、USB、LANの3種類のインタフェースがあります。電源投入時には3種類のインタフェースすべてが使用可能な状態です。リモート・インタフェースの構成と使用については、付属の『ユーザーズ・ガイド』を参照してください。



この情報は、予告なしに変更されることがあります。

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2014年11月

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# 키사이트 테크놀로지스 시스템 DC 전원 공급기 N5700 시리즈

빠른 참조 설명서



## 안전 고지

본 장비를 사용하는 모든 단계에서 다음 일반 안전 조치를 따라야 합니다. 이러한 안전 조치나 본 설명서 내의 특정 경고 또는 지시 사항을 따르지 않으면 기기의 설계, 제조 및 용도

상 안전 기준을 지키지 않게 됩니다.

Keysight Technologies 는 이러한 요구사항을 지키지 않아 발생하는 결과에 대해 책임지지 않습니다.

### 일반 사항

제조사가 지정한 용도 이외로 본 제품을 사용하지 마십시오. 사용 지침과 다르게 사용하는 경우 본 제품의 보호 기능이 손상될 수 있습니다.

### 전원을 공급하기 전에

모든 안전 조치가 취해졌는지 확인하십시오. 전원을 공급하기 전에 모든 장치를 연결하십시오. 기기 외관에 표시된 "안전 기호" 아래의 설명을 참고하십시오.

### 기기의 접지

본 제품은 안전 등급 1 기기입니다 (보호용 접지 단자 제공). 감전의 위험을 최소화하기 위해 기기 새시와 커버를 전기 접지에 연결해야 합니다. 접지선이 전원 콘센트에 있는 전기 접지(안전 접지)에 단단히 연결된 상태에서, 기기를 접지된 전원 케이블을 통해 AC 주전원에 연결해야 합니다. 보호 (접지) 컨덕터를 무효로 만들거나 보호 접지 단자의 연결을 끊으면 잠재적인 감전으로 신체 상해를 입을 수 있습니다.

### 퓨즈

재생한 퓨즈나 단락된 퓨즈 홀더를 사용하지 마십시오.

### 폭발 위험이 있는 곳에서 사용하지 마십시오

가연성 가스나 증기가 있는 곳에서 기기를 사용하지 마십시오.

### 기기 커버를 제거하지 마십시오

수리 교육을 이수하여 관련 위험을 알고 있는, 자격을 갖춘 사람만이 기기 커버를 제거해야 합니다. 기기 커버를 제거하기 전에 항상 전원 케이블 및 모든 외부 회로를 차단하십시오.

### 기기를 개조하지 마십시오

대용 부품을 사용하거나 제품을 무단으로 개조하지 마십시오. 수리나 정비를 위해서 제품을 키사이트 영업소나 수리센터로 보내주셔야 안전 기능이 손상되지 않습니다.

### 손상된 경우

기기가 손상되거나 결함이 있는 것으로 판단되면 자격을 갖춘 서비스 직원의 수리를 받을 때까지 작동을 멈추고 사용하지 못하도록 안전하게 보호하십시오.

### 주의

주의 표시는 위험을 나타냅니다. 이는




















- 올바로 이행하거나 지키지 않을 경우 제품이 손상되거나
- 중요 데이터가 손실될 수 있는 작동 절차나 사용 방식 등에 주의를 주기 위한 것입니다. 주의 내용을 완전히 이해하지 못하거나 조건이 만족되지 않는 경우 작업을 진행하지 마십시오.

### 경고

경고 표시는 위험을 나타냅니다. 이는

- 올바로 이행하거나 지키지 않을 경우 신체 상해나 사망에 이를 수 있는 작동 절차나 사용 방식 등에 주의를 주기 위한 것입니다. 경고 내용을 완전히 이해하지 못하거나 조건이 만족되지 않는 경우 작업을 진행하지 마십시오.

### 안전 기호

	직류
	교류
	직류 및 교류
	3상 교류
	접지 단자
	보호용 접지 단자
	프레임 또는 새시 단자
	단자가 접지 전위에 있음
	영구 설치된 장비의 중성 컨덕터
	영구 설치된 장비의 라인 컨덕터
	전원 공급
	전원 차단
	공급 대기. 스위치를 꺼도 기기가 AC 주전원에서 완전히 분리되지 않습니다.
	2단 누름 단추가 눌린 상태
	2단 누름 단추가 눌리지 않은 상태
	주의, 감전의 위험이 있음
	주의, 표면이 뜨거움
	주의, 해당 문서 참조
	가정용 쓰레기로 버리지 마십시오.



## 법률 고지

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미국 및 국제 저작권법에 의거하여 키사이트테크놀로지의 사전 서면 동의 없이는 이 문서를 복사, 전제하거나 다른 언어로 번역할 수 없습니다.

이 문서의 내용은 "있는 그대로" 제공되며 향후 발행물에서 예고 없이 변경될 수 있습니다. 또한 적용 법률이 허용하는 범위 내에서 상품성이나 특정 목적에의 적합성에 대한 묵시적 보증을 포함하여 본 설명서와 설명서 내의 모든 정보와 관련하여 키사이트는 어떠한 명시적 또는 묵시적 보증을 하지 않습니다. 키사이트는 본 문서 혹은 여기에 포함된 정보의 오류나 이를 제공, 사용 또는 실행하는 것과 관련하여 발생하는 파생적 또는 부수적 손해에 대해 책임지지 않습니다. 키사이트와 사용자가 별도 작성한 서면 동의서에 이러한 조건과 상반되는 본 문서의 내용을 다루는 보증 조건이 있다면 별도 동의서의 보증 조건이 적용됩니다.

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## 키사이트 N5700 DC 전원 공급기 – 개요

키사이트테크놀로지스의 N5700 시리즈 시스템 DC 전원 공급기는 매우 폭 넓은 정격 출력 전압과 전류를 제공하는 범용 스위칭 전원 공급기입니다.

이 전원 공급기는 전력 인자로 교정되어 있으며 전세계 AC 전압 범위에서 작동합니다. 출력 전압과 전류가 연속적으로 표시되고 LED 표시기가 전원 공급기의 전체 작동 상태를 보여줍니다.

사용자는 전면 패널 제어를 통해 출력 파라미터, 과전압, 저전압 및 과전류 보호 레벨을 설정하고 설정을 미리 볼 수 있습니다.

후면 패널에는 아날로그 신호나 내장된 원격 통신 인터페이스를 통해 전원 공급기 작동을 제어하고 감시하는데 필요한 커넥터가 있습니다.

### 출력 기능

- 자동 교환의 정전압/정전류
- 높은 분해능의 전압 및 전류 전면 패널 제어
- 정확한 전압 및 전류 리드백
- 독립된 에지 트리거 외부 차단 및 레벨 트리거 외부 설정/해제
- 능동적 전류 공유로 병렬 마스터/슬레이브 작동
- 로드 리드에서의 전압 강하를 보상하는 원격 감지
- 아날로그 출력 프로그래밍 및 감시

### 시스템 기능

- 내장 GBIB/LAN/USB 인터페이스
- 내장된 웹 서버로 컴퓨터의 인터넷 브라우저에서 기기를 직접 제어합니다.
- 치밀한 내부 구조 – 전원 공급기 상단과 하단 표면에 통풍구 없음
- 능동 전원 인자 교정의 범용 입력 전압
- 소음 감소와 팬 수명 연장을 위한 팬 속도 제어

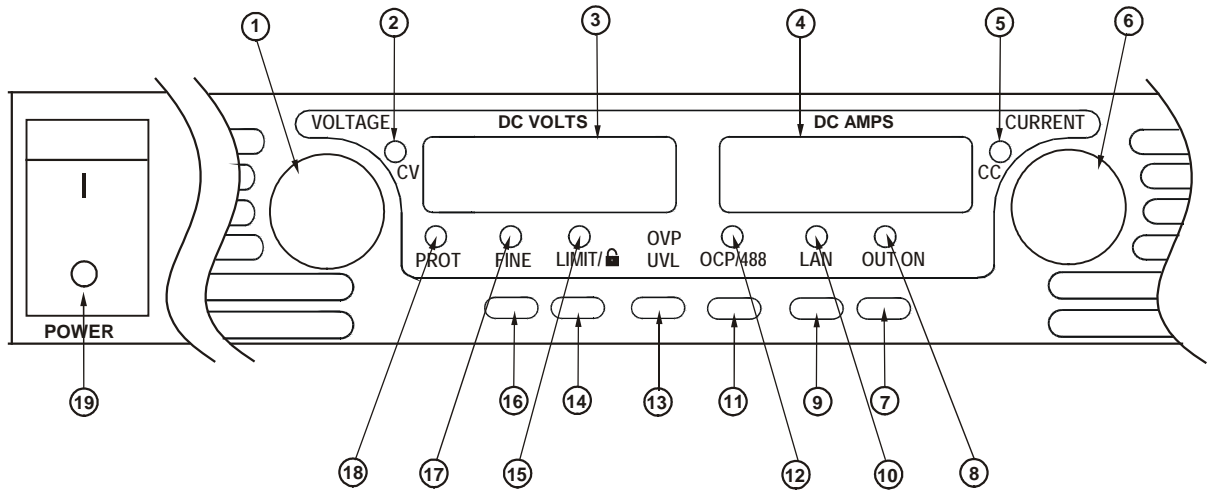
## 프로그래밍 기능

- 출력 전압 및 전류 설정
- 출력 전압 및 전류 측정
- 출력 전압 및 전류 트리거 설정
- 출력 On/Off 제어
- 과전류 보호 설정
- 과전압 보호 설정 및 리드백
- 저전압 한계 설정 및 리드백
- 시작 모드 (마지막 설정 또는 재설정 모드)
- 상태 레지스터 설정 및 리드백
- 버스 트리거
- 교정

## 모델 정격

모델	전압 범위	전류 범위	모델	전압 범위	전류 범위
N5741A	0 – 6V	0 – 100A	N5761A	0 – 6V	0 – 180A
N5742A	0 – 8V	0 – 90A	N5762A	0 – 8V	0 – 165A
N5743A	0 – 12.5V	0 – 60A	N5763A	0 – 12.5V	0 – 120A
N5744A	0 – 20V	0 – 38A	N5764A	0 – 20V	0 – 76A
N5745A	0 – 30V	0 – 25A	N5765A	0 – 30V	0 – 50A
N5746A	0 – 40V	0 – 19A	N5766A	0 – 40V	0 – 38A
N5747A	0 – 60V	0 – 12.5A	N5767A	0 – 60V	0 – 25A
N5748A	0 – 80V	0 – 9.5A	N5768A	0 – 80V	0 – 19A
N5749A	0 – 100V	0 – 7.5A	N5769A	0 – 100V	0 – 15A
N5750A	0 – 150V	0 – 5A	N5770A	0 – 150V	0 – 10A
N5751A	0 – 300V	0 – 2.5A	N5771A	0 – 300V	0 – 5A
N5752A	0 – 600V	0 – 1.3A	N5772A	0 – 600V	0 – 2.5A

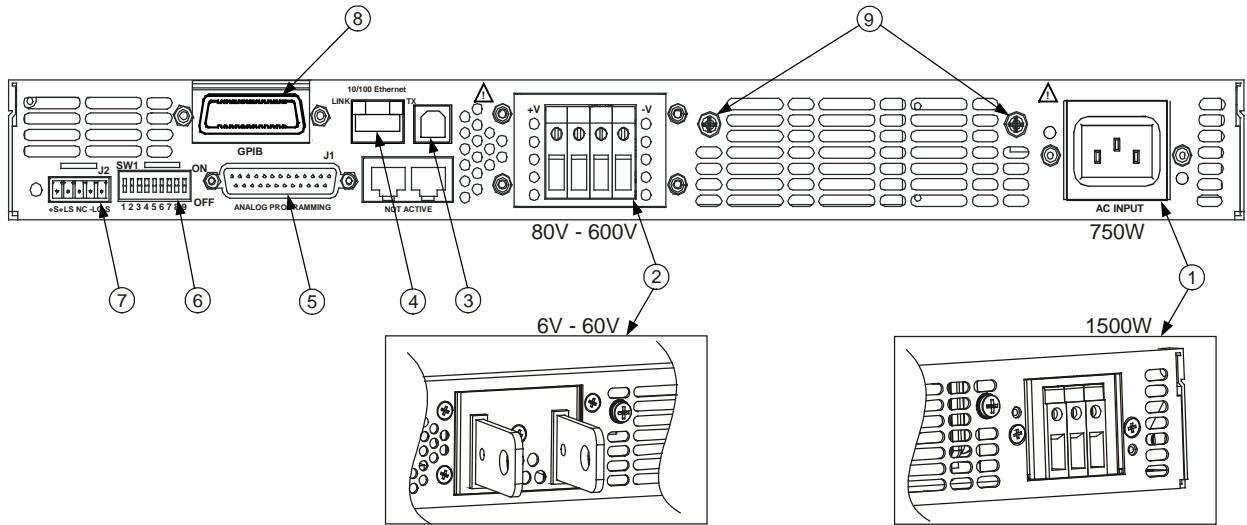
## 전면 패널 - 개요



- 1 - 전압 노브**      전압 기능: 출력 전압, 과전압 보호 레벨 및 저전압 한계를 조절합니다. 과전압 보호나 저전압 한계가 설정되면 이 한계를 넘어 출력 전압을 프로그래밍할 수 없습니다.
- 2 - CV 표시기**      여기에 불이 들어오면 장치가 정전압 모드에서 작동하여 출력 전압이 일정하게 유지되고 있음을 나타냅니다.
- 3 - DC 전압 디스플레이**      감지 단자에서 측정된 전압을 표시하는 LED 디스플레이. LIMIT 를 누르면 이 디스플레이에 프로그램된 전압 설정이 표시됩니다. OVP/UVL 을 누르면 이 디스플레이에 OVP 나 UVL 설정이 표시됩니다. OCP/488 을 누르고 있으면 이 디스플레이에 GPIB 주소가 표시됩니다. LAN 을 누르고 있으면 이 디스플레이에 IP 및 이더넷 주소가 표시됩니다.
- 4 - DC AMPS 디스플레이**      출력 단자에서 측정된 전류를 표시하는 LED 디스플레이. LIMIT 를 누르면 이 디스플레이에 프로그램된 전류 설정이 표시됩니다. LAN 을 누르고 있으면 이 디스플레이에 IP 및 이더넷 주소가 표시됩니다.
- 5 - CC 표시기**      여기에 불이 들어오면 장치가 정전류 모드에서 작동하여 출력 전류가 정하게 유지되고 있음을 나타냅니다.
- 6 - 전류 노브**      출력 전류를 조절합니다.
- 7 - OUT ON 버튼**      출력 기능: OUT ON 을 눌러 출력을 끄거나 켭니다. OVP 나 OCP 이벤트가 발생한 후에 OUT ON 을 누르면 출력이 재설정되어 켜집니다.
- 시작 기능: 안전 시작 및 자동 재시작 모드 중에서 선택합니다. OUT ON 버튼을 누르고 있으면 안전 시작과 자동 재시작이 번갈아가며 바뀝니다. 디스플레이는 SAF 와 AU7 이 번갈아가며 바뀝니다. 이 모드 중 하나가 표시될 때 OUT ON 버튼을 놓으면 해당 모드가 선택됩니다.
- 8 - OUT ON 표시기**      불이 들어오면 출력이 사용 또는 ON 임을 나타냅니다.

<b>9 – LAN 버튼</b>	<p><u>주소 보기:</u> LAN 을 눌러 IP 주소와 이더넷 주소를 봅니다. 디스플레이에 먼저 IP 주소의 4 세그먼트가 스크롤되고 이어서 이더넷(EA) 주소의 6 세그먼트가 표시됩니다. 아무 키나 눌러 주소 디스플레이를 끕니다.</p> <p><u>주소 재설정:</u> LAN 버튼을 3 초간 누릅니다. 메시지 “LAn rES”가 표시된 동안 LAN 버튼을 다시 눌러 LAN 구성을 출고 시 기본 설정으로 재설정합니다. 설정에 대한 내용은 사용 설명서를 참고하십시오.</p>
<b>10 – LAN 표시기</b>	<p>켜져 있을 때는 LAN 이 구성되었고 정상적으로 작동하고 있음을 나타냅니다. 깜박일 때는 장치의 웹 홈페이지를 통해 표시등이 깜박이도록 설정된 장치를 확인합니다</p>
<b>11 – OCP/488 버튼</b>	<p><u>사용 설정 기능:</u> OCP/488 을 눌러 과전류 보호를 켭니다. OCP/488 을 다시 누르면 과전류 보호가 꺼집니다.</p> <p><u>OCP 재설정:</u> 과전류 보호 이벤트가 발생하면 OUT ON 버튼을 눌러 출력을 켜고 과전류 보호를 재무장시킵니다.</p> <p><u>GPIO 주소:</u> OCP/488 버튼을 3 초동안 누르면 전압 노브로 GPIO 주소를 설정할 수 있습니다.</p>
<b>12 – OCP 표시기</b>	<p>불이 들어오면 과전류 보호가 사용 가능 또는 사용중임을 나타냅니다.</p>
<b>13 – OVP/UVL 버튼</b>	<p><u>OVP 기능:</u> OVP/UVL 을 한번 눌러 전압 노브의 과전압 보호 레벨을 정합니다 (디스플레이에 OUP 가 표시됨). 현재 출력 전압 설정 위쪽으로 약 5% 이하로는 과전압 보호를 설정할 수 없습니다.</p> <p><u>UVL 기능:</u> OVP/UVL 을 두 번 눌러 전압 노브의 저전압 프로그래밍 한계를 설정합니다 (디스플레이에 UUL 이 표시됨). 현재 출력 전압 설정 아래쪽으로 약 5% 이상으로는 저전압 보호를 설정할 수 없습니다.</p>
<b>14 – LIMIT 버튼</b>	<p><u>한계 기능:</u> LIMIT 를 눌러 출력 전압과 전류 한계를 표시합니다. 디스플레이에 5 초 동안 설정이 표시된 다음 실제 출력 전압과 전류로 바뀝니다.</p> <p><u>잠금 기능:</u> LIMIT 버튼을 누르고 있으면 전면 패널 잠금과 전면 패널 잠금 해제 사이에서 전환됩니다. 디스플레이는 LFP 와 UFP 가 번갈아 바뀝니다. 이 모드 중 하나가 표시될 때 LIMIT 버튼을 놓으면 해당 모드가 선택됩니다. 디스플레이에 rLFP 가 나타나면 원격 프로그래밍 명령에 의해 전면 패널이 잠긴 것입니다.</p>
<b>15 – LIMIT 표시기</b>	<p>불이 들어 오면 LIMIT 버튼이 눌러졌음을 나타냅니다.</p>
<b>16 – FINE 버튼</b>	<p>Fine 또는 Coarse 조정 제어 중에서 선택합니다. Fine 모드에서는 전압 및 전류 노브가 고 분해능으로 작동하고 Coarse 모드에서는 저 분해능 (대략 6 회전)으로 작동합니다.</p>
<b>17 – FINE 표시기</b>	<p>불이 들어오면 장치가 Fine 조절 모드에 있음을 나타냅니다.</p>
<b>18 – PROT 표시기</b>	<p>깜박이면 장애가 발생했음을 나타냅니다.</p> <p>OVP, OCP, OTP, Enable 장애 및 AC 장애가 감지되면 PROT 표시기가 깜박입니다. 장치를 끈 후에 몇 초간 장치 내부에 잔류 에너지가 남아있기 때문에 PROT 표시기가 깜박이고 디스플레이에 AC 가 표시될 수 있습니다.</p>
<b>19 – POWER 스위치</b>	<p>전원 공급기를 켜거나 끕니다.</p>

## 후면 패널 - 개요



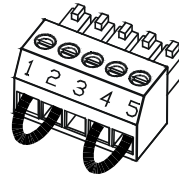
- |                           |  |
|---------------------------|--|
| <b>1 - AC 입력 커넥터</b>      | 1500W 출력 모델용 와이어 클램프 커넥터<br>750W 출력 모델용 IEC 커넥터  |
| <b>2 - DC 출력 커넥터</b>      | 80V ~ 600V 모델용 와이어 클램프 커넥터<br>6V ~ 60V 모델용 버스 바  |
| <b>3 - USB 커넥터</b>        | USB 인터페이스 연결용 커넥터  |
| <b>4 - LAN 커넥터</b>        | LAN 인터페이스 연결용 커넥터. LINK LED 는 링크 무결성을 나타냅니다. TX LED 는 LAN 작동을 나타냅니다. LAN 설정은 사용 설명서를 참조하십시오.   |
| <b>5 - 아날로그 프로그래밍 커넥터</b> | 아날로그 인터페이스용 커넥터. 출력 전압 및 전류 한계 프로그래밍과 감시 신호, 차단 제어 (전기 신호), 설정/해제 제어 (드라이 접촉), 전원 공급기 OK (Power Supply OK) 신호 및 작동 모드 (CV/CC) 신호가 포함됩니다. (자세한 내용은 다음 페이지 참조) |
| <b>6 - SW1 설정 스위치</b>     | 출력 전압, 전류 한계 및 기타 제어 기능에 대한 원격 프로그래밍과 감시 모드를 선택하기 위한 9-위치 스위치. (자세한 내용은 다음 페이지 참조)   |
| <b>7 - 원격 감지 커넥터</b>      | 로드 전압을 조절하고 배상 전압 강하를 보상하기 위해 원격 감지를 연결하기 위한 커넥터 (자세한 내용은 다음 페이지 참조)   |
| <b>8 - GPIB 커넥터</b>       | GPIB 인터페이스 연결용 커넥터   |
| <b>9 - 접지 나사</b>          | 새시 접지 연결을 위한 M4x8 나사   |

### 경고

감전 위험! 전원 코드의 세 번째 컨덕터가 새시 접지로 이용됩니다. 전원 콘센트가 3 구 유형이며 해당 핀이 접지에 연결되어 있는지 확인하십시오.

## J2 감지 커넥터

- 1 - 원격 감지 (+)
- 2 - 로컬 감지 (+)
- 3 - 미사용
- 4 - 로컬 감지 (-)
- 5 - 원격 감지 (-)



플러그 유형: MC 1.5/5-ST-3.81, Phoenix  
 와이어 크기: AWG 28 ~ AWG 16  
 피복 제거 길이: 7mm (0.28 인치)  
 토크: 0.22 - 0.25 Nm (1.95 - 2.21 in-lb.)

그림에는 출고 시 구성을 나타내었습니다.

## SW1 설정 스위치

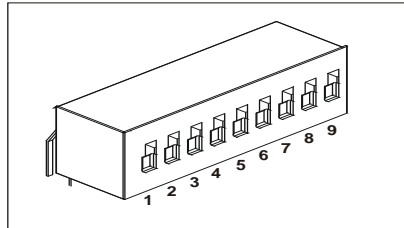
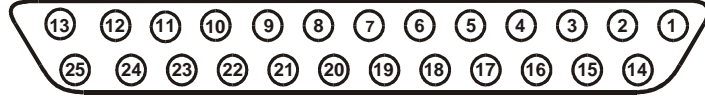


Fig.4-3: SW1 setup DIP switch  
 모든 스위치에서 출고 시 설정은 Down 입니다.

- |                             |   |
|-----------------------------|---|
| <p>1 - 출력 전압, 전압 프로그래밍</p>  | <p><u>Down</u>: 전면 패널에서 출력 전압을 프로그래밍합니다.</p> <p><u>Up</u>: 외부 전압 신호로 출력 전압을 프로그래밍합니다.</p>   |
| <p>2 - 출력 전류, 전압 프로그래밍</p>  | <p><u>Down</u>: 전면 패널에서 출력 전류를 프로그래밍합니다.</p> <p><u>Up</u>: 외부 전압 신호로 출력 전류를 프로그래밍합니다.</p>   |
| <p>3 - 프로그래밍 범위 (전압/저항)</p> | <p><u>Down</u>: 원격 프로그래밍 범위: 0 - 5V / 0 - 5KΩ</p> <p><u>Up</u>: 원격 프로그래밍 범위: 0 - 10V / 0 - 10KΩ</p>   |
| <p>4 - 전압 및 전류 감시 범위</p>    | <p><u>Down</u>: 원격 감시 범위: 0 - 5V</p> <p><u>Up</u>: 원격 프로그래밍 범위: 0 - 10V</p>   |
| <p>5 - 차단 논리 선택</p>         | <p><u>Down</u>: OUT OFF = 낮음 (0 - 0.6V) 또는 단락, OUT ON = 높음 (2V - 15V) 또는 개방</p> <p><u>Up</u>: OUT OFF = 높음 (2V - 15V) 또는 개방, OUT ON = 낮음 (0 - 0.6V) 또는 단락</p> |
| <p>6 - 미사용</p>              |   |
| <p>7 - 출력 전압, 저항 프로그래밍</p>  | <p><u>Down</u>: 전면 패널에서 출력 전압을 프로그래밍합니다.</p> <p><u>Up</u>: 외부 저항기로 출력 전압을 프로그래밍합니다.</p>   |
| <p>8 - 출력 전류, 저항 프로그래밍</p>  | <p><u>Down</u>: 전면 패널에서 출력 전류를 프로그래밍합니다.</p> <p><u>Up</u>: 외부 저항기로 출력 전류를 프로그래밍합니다.</p>   |
| <p>9 - 설정/해제 제어</p>         | <p><u>Down</u>: J1 설정+/설정- 핀이 활성이 아닙니다.</p> <p><u>Up</u>: J1 설정+/설정- 핀이 활성입니다.</p>  |

## J1 아날로그 프로그래밍 커넥터



결합 플러그: AMP 부품 번호 745211-2  
 와이어 크기: AWG 26 ~ AWG 22  
 추출 도구: AMP 부품 번호 91232-1 또는 이에 상응하는 도구

출고 시 기본 구성은 로컬 작동이며 이 때는 J1 에 연결하지 않아도 됩니다.

핀 1:	설정 입력	핀 1 – 핀 14 연결로 출력 설정. 출력을 해제하려면 연결 해제
핀 2, 3:	새시 공통	핀 15 및 핀 16 에 대한 신호 반환, 새시에 연결
핀 4-7:	미사용	연결 없음
핀 8:	로컬/아날로그	출력의 아날로그 프로그래밍 또는 전면 패널 사이에서 선택하기 위한 입력
핀 9:	전압 프로그램	출력 전압의 전압 또는 저항 프로그래밍을 위한 입력
핀 10:	전류 프로그램	출력 전류의 전압 또는 저항 프로그래밍을 위한 입력
핀 11:	전압 모니터	출력 전압 감시를 위한 출력
핀 12:	공통	핀 8, 핀 11, 핀 13 및 핀 24 에 대한 신호 반환. -S 에 내부적으로 연결.
핀 13:	<b>CV/CC</b>	정전압/정전류 모드 표시를 위한 출력
핀 14:	설정 출력	핀 14 – 핀 1 연결로 출력 설정. 출력을 해제하려면 연결 해제.
핀 15:	차단	출력의 차단 제어를 위한 입력. 새시 공통 참조.
핀 16:	전원 공급기 OK	전원 공급기 상태를 나타내기 위한 출력. 새시 공통 참조.
핀 17-20:	미사용	연결 없음
핀 21:	로컬/아날로그 상태	로컬 또는 아날로그 프로그래밍 모드의 표시를 위한 출력
핀 22:	전압 프로그래밍 반환	핀 9 에 대한 신호 반환. -S 에 내부적으로 연결.
핀 23:	전류 프로그래밍 반환	핀 10 에 대한 신호 반환. -S 에 내부적으로 연결.
핀 24:	전류 모니터	출력 전류 감시를 위한 출력
핀 25:	병렬	병렬 작동에서 전류 밸런싱을 위한 출력



## 장비 설치

### 안전 고려사항

본 전원 공급기는 안전 등급 1에 해당하는 기기로서 보호용 접지 단자가 있습니다. 이 단자는 접지구가 있는 전원 콘센트를 통해 접지로 연결해야 합니다. 일반 안전 정보에 대해서는 본 설명서 앞부분에 있는 안전 요약 페이지를 참조하십시오.

### 환경

#### 경고

가연성 가스나 증기가 있는 곳에서 기기를 사용하지 마십시오.

#### 주의

장치 전면의 공기 흡입이나 후면의 공기 배출구를 막지 마십시오.

본 기기는 제어된 환경의 실내에서만 사용해야 합니다. 주변 온도가 40°C를 초과하는 곳에서 전원 공급기를 사용하지 마십시오.

팬은 전면에서 공기를 흡입하고 후면에서 배출시켜 전원 공급기를 냉각 시킵니다. 적합한 통풍을 위해 장치 전면 및 후면에 적어도 10cm (4인치)의 충분한 공간을 두고 장비를 설치해야 합니다.

### 랙 장착

키사이트 N5700 전원 공급기는 표준 19인치 랙 패널이나 캐비닛에 장착할 수 있습니다. 랙에 전원 공급기를 장착하는 경우:

1. 전면 패널의 랙 장착 브래킷을 사용하여 전원 공급기를 랙에 장착합니다.
2. 지지 브래킷을 사용하여 전원 공급기 후면을 적당히 지지합니다.
3. 랙 장착 슬라이드를 사용하는 경우 키사이트 N5740A 랙 장착 슬라이드 키트를 사용하여 장치를 표준 19인치 장비 랙에 설치하십시오. 각 측면에서 3개의 #10-32 x 3/8인치 (최대) 나사를 사용합니다. 내부 부품의 손상을 방지하기 위해 지정된 길이의 나사만 사용하십시오.

### 청소

#### 경고

감전 위험! 감전을 방지하기 위해 청소하기 전에 장치의 전원 코드를 뽑으십시오.

마른 헝겊이나 물을 약간 적신 헝겊으로 외부 케이스 부분을 닦으십시오. 내부는 청소하지 마십시오.

## 라인 코드 연결

### 경고

감전 위험! 전원 코드의 세 번째 커넥터가 새시 접지로 사용됩니다. 전원 콘센트가 3 구 유형이며 해당 핀이 접지에 연결되어 있는지 확인하십시오.

화재 위험! 기기와 함께 제공된 전원 코드만 사용하십시오. 다른 종류의 전원 코드를 사용하면 전원 코드가 과열되어 화재가 발생할 수 있습니다.

### 참고

비상 차단 장치로 분리형 전원 코드를 사용할 수 있습니다. 전원 코드를 제거하면 장치에 AC 전원 입력이 차단됩니다.

장치 후면의 AC 입력은 범용 AC 입력입니다. 이 입력은 85VAC ~ 265VAC 범위의 라인 전압을 받아들입니다. 주파수 범위는 47Hz ~ 63Hz 입니다.

750W 장비의 입력 전류 요구조건은 100VAC 에서 10.5A 및 200VAC 에서 5A 입니다. 1500W 장비의 전류 요구조건은 100VAC 에서 21A 및 200VAC 에서 11A 입니다.

## 750W 장비의 입력 연결

전원 코드를 장치 후면의 IEC 320 커넥터에 연결합니다. IEC 커넥터는 AC 코드를 접지된 AC 콘센트에 꽂았을 때 안전 접지 연결을 제공합니다.

장치에 잘못된 전원 코드가 제공된 경우에는 가까운 키사이트 영업소나 서비스 센터로 연락하십시오.

## 1500W 장비의 입력 연결

### 주의

인가된 전기 기사나 기타 자격을 갖춘 사람이 이 전원 공급기에 AC 전원을 연결해야 합니다.

AC 입력 커넥터는 후면 패널에 있는 3 단자 와이어 클램프입니다. 적합한 와이어와 조임 토크를 사용하십시오.

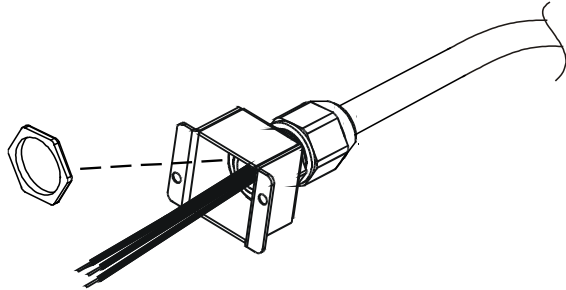
와이어 크기: AWG 12 또는 AWG 10

토크: 6.5 – 7.0 in-lb.

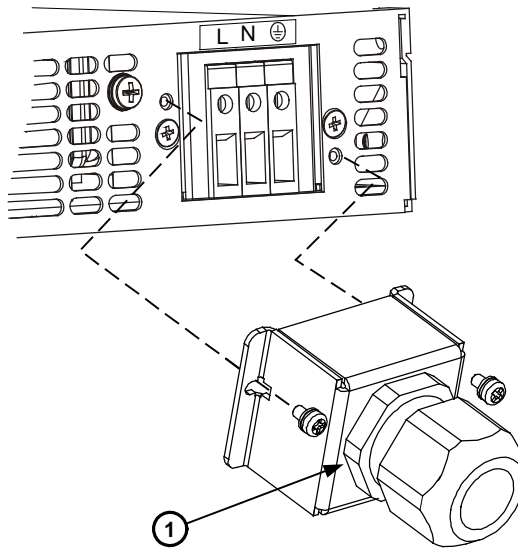
다음과 같이 케이블을 AC 입력 커넥터에 연결합니다.

- AC 케이블의 절연 피복을 약 10cm (4 인치) 벗겨냅니다. 접지 와이어가 다른 와이어보다 10mm (0.4 인치) 길게 나오도록 와이어를 정리합니다. 각 와이어 끝을 14mm (0.55 인치) 벗겨냅니다.

- 저압 너트에서 응력 완화 베이스를 풉니다. 고정 너트를 AC 입력 커버 안쪽에 넣습니다. 베이스를 AC 입력 커버의 바깥 열린 부분에 넣고 베이스를 고정 너트에 단단히 조입니다.



- 저압 너트를 AC 케이블로 밀어 넣습니다. 벗겨낸 와이어를 피복 부분이 베이스 가장자리까지 올 때까지 응력 완화 베이스에 집어넣습니다. 렌치를 사용하여 베이스가 돌아가지 않게 합니다. 케이블이 움직이지 않도록 하면서 저압 너트를 베이스에 고정시킵니다.
- 필요에 따라 AC 와이어를 입력 커넥터 단자에 연결합니다. 와이어를 연결하려면 단자 나사를 풀고 피복을 벗긴 와이어를 단자에 넣은 다음 나사를 단단히 조입니다.
- 와이어를 커버 내부로 집어넣어 끼이지 않도록 합니다. 제공된 M3 x 8 납작 머리 나사로 커버를 장치에 고정시킵니다. 다음 그림을 참조하십시오.



1 - 조립된 응력 완화

## 로드 연결 (6V ~ 60V 장비)

### 경고

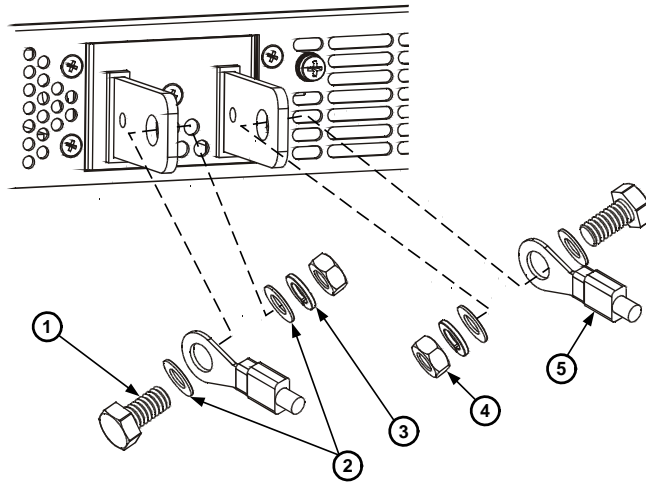
감전 위험! 후면 패널에서 연결 작업을 시작하기 전에 **AC 전원을 차단**하십시오. 모든 와이어와 스트랩은 나사를 완전히 조여 올바르게 연결해야 합니다.

위해한 고전압에 감전되지 않도록 로드와 그 연결부에 전기가 흐르는 부분이 노출되지 않도록 하십시오. 로드 배선의 절연 등급은 전원 공급기의 최대 출력 전압 이상이 되도록 하십시오.

### 주의

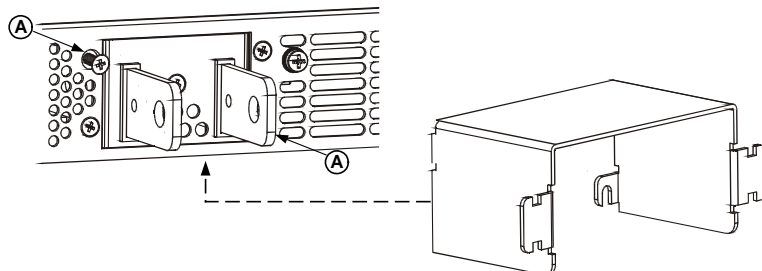
장착 철재 부속품이 출력 단자와 접촉되지 않도록 하십시오. 무거운 연결 케이블에는 특정 형태의 응력 완화를 사용하여 연결이 헐거워지거나 버스 막대가 휘지 않도록 해야 합니다.

다음 그림에 나타난 것처럼 모든 로드 와이어는 단자를 단단히 부착하여 적합하게 중단 처리해야 합니다. 중단 처리되지 않은 와이어를 전원 공급기의 로드 연결에 사용하지 마십시오.



- 1 - 나사      2 - 워셔      3 - 스프링 워셔  
4 - 너트      5 - 와이어 단자 러그

로드 와이어 연결이 끝났으면 보호 덮개를 덮습니다. A로 표시된 새시 나사로 외피를 연결합니다.



## 로드 연결(80V ~ 600V 장비)

### 경고

감전 위험! 후면 패널에서 연결 작업을 시작하기 전에 AC 전원을 차단하십시오. 모든 와이어와 스트랩은 나사를 완전히 조여 올바르게 연결해야 합니다.

위해한 고전압에 감전되지 않도록 로드와 그 연결부에 전기가 흐르는 부분이 노출되지 않도록 하십시오. 로드 배선의 절연 등급은 전원 공급기의 최대 출력 전압 이상이 되도록 하십시오.

80V~600V 모델에는 4 개의 단자 와이어 클램프 출력 커넥터가 있습니다. 왼쪽 2 개의 단자는 양극 출력이고 오른쪽 2 개의 단자는 음극 출력입니다. 커넥터 규격은 다음과 같습니다.

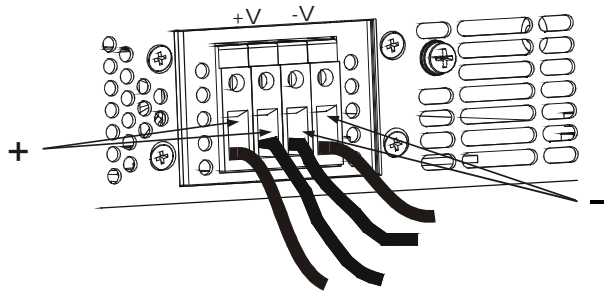
와이어 크기: AWG 18 ~ AWG 10

피복 제거 길이: 10mm (0.39 인치)

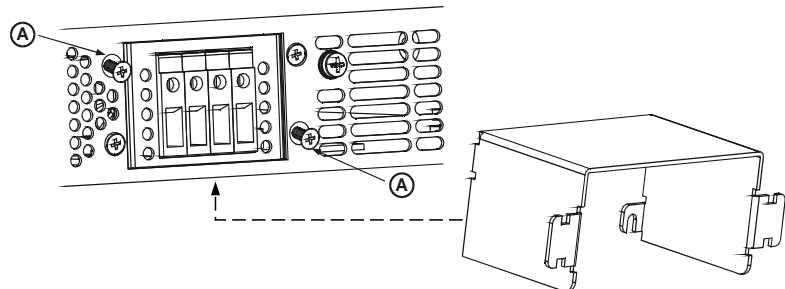
토크: 6.5 - 7 in-lb.

로드 와이어를 다음과 같이 전원 공급기에 연결합니다.

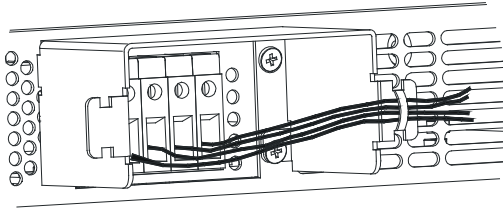
- 와이어를 약 10mm (0.39 인치) 벗겨냅니다.
- 커넥터 단자 나사를 풀고 벗겨낸 와이어를 단자에 넣습니다. 단자 나사를 단단히 조입니다.



- A 로 표시된 2 개의 새시 나사를 반정도 풀니다.
- 새시에 보호 덮개를 조립하고 두 개의 나사를 조여 덮개를 새시에 고정합니다.



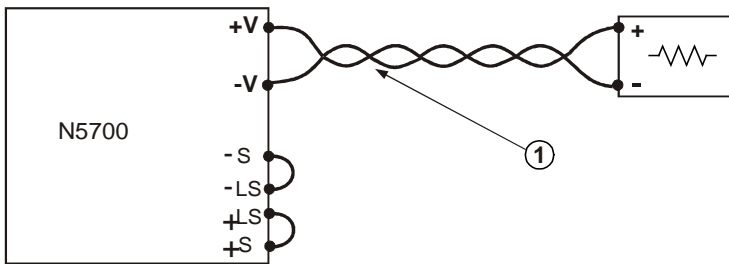
- 타이-랩 등을 사용하여 덮개 한쪽에 와이어를 묶습니다. 응력이 적당히 완화되도록 덮개 내부의 와이어 길이를 충분히 길게 하십시오.



## 출력 전압 감지

### 로컬 감지

전원 공급기는 출력 전압을 로컬로 감지하기 위해 후면 패널 J2 감지 커넥터가 배선된 상태에서 출고됩니다 (9 페이지 참조). 로컬 감지의 경우 출력 전압은 출력 단자에서 조절됩니다. 원격 감지는 로드 전류가 낮은 경우나 로드 조절이 덜 중요한 경우에만 권장합니다.

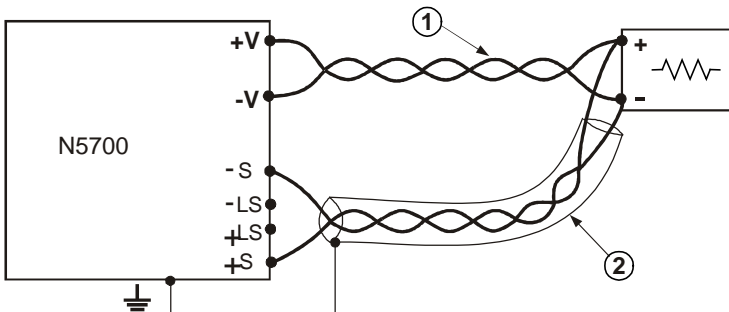


1 - 로드 라인. 꼬임 쌍선, 가능한 가장 짧은 길이.

### 원격 감지

로드에서의 로드 조절이 중요한 경우에 원격 감지를 사용합니다. 원격 감지를 통해 전원 공급기는 로드 리드 선에서의 전압 강하를 자동으로 보상할 수 있습니다.

꼬임 또는 차폐 와이어를 사용하여 노이즈 픽업을 최소화합니다. 차폐 와이어가 사용된 경우 차폐를 전원 공급기 새시나 로드 접지 중 한 지점에 접지시켜야 합니다.



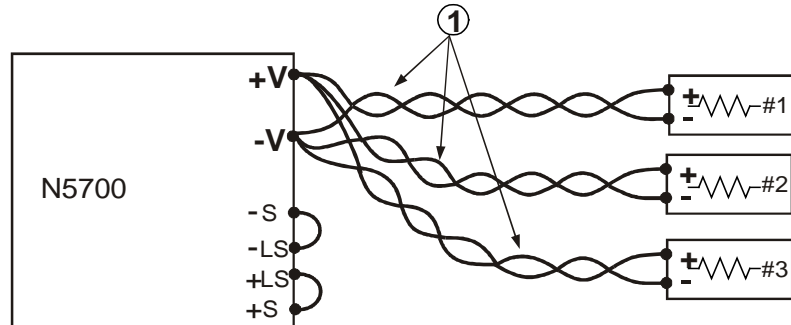
1 - 로드 라인. 꼬임 쌍선, 가능한 가장 짧은 길이.

2 - 감지 라인. 꼬임 쌍선 또는 차폐 와이어.

# 로드 고려사항

## 다중 로드

다음 그림은 한 전원 공급기에 연결된 여러 로드를 보여줍니다. 각 로드는 개별 와이어 쌍을 사용하여 전원 공급기의 출력 단자에 연결해야 합니다. 노이즈 픽업과 전자기 방출을 최소화하기 위해 각 와이어 쌍은 가능한 짧고 꼬여 있거나 차폐시키는 것이 좋습니다.

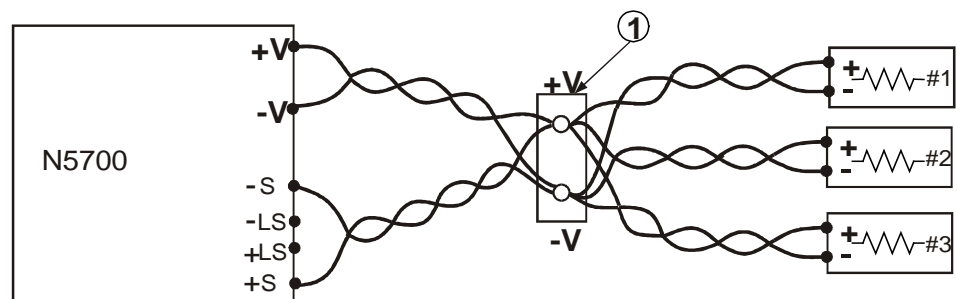


1 - 로드 라인. 꼬임 쌍선, 가능한 가장 짧은 길이.

다음 그림에 나타난 것처럼 원격 위치의 분배 단자가 사용되는 경우 한 쌍의 꼬임 및/또는 차폐 와이어로 전원 공급기 출력 단자를 원격 분배 단자에 연결해야 합니다. 각 로드를 분배 단자에 개별적으로 연결합니다. 이러한 상황에서는 원격 전압 감지를 권장합니다.

## 유도 로드

유도 로드는 전원 공급기에 해로울 수 있는 전압 스파이크를 유발할 수 있습니다. 출력 양단에서 다이오드를 연결해야 합니다. 이 다이오드의 정격 전압 및 전류는 전원 공급기의 최대 정격 출력 전압 및 전류보다 커야 합니다. 양극을 전원 공급기의 양극 출력에, 음극을 음극 출력에 연결합니다.



1 - 분배 단자.

## 출력 접지

전원 공급기의 출력은 접지로부터 절연됩니다. 출력 단자 중 하나를 접지시켜 출력에서 양극이나 음극 전압을 얻을 수 있습니다. 시스템을 어떻게 또는 어디에 접지 시키는가에 상관 없이 항상 두 와이어를 사용하여 로드를 출력에 연결하십시오. 노이즈 문제를 피하려면 출력 단자를 가능한 전원 공급기 새시 접지에 가깝게 접지 시키십시오.

### 경고

#### 감전 위험!

최대 60VDC 정격 출력 모델의 경우 출력의 어떤 지점도 새시 접지의  $\pm 60\text{VDC}$  이상 또는 이하여서는 안 됩니다.

60VDC 이상의 정격 출력 모델인 경우 양극 출력의 어떤 지점도 새시 접지의  $\pm 60\text{VDC}$  이상 또는 이하여서는 안 됩니다.

60VDC 이상의 정격 출력 모델인 경우 음극 출력의 어떤 지점도 새시 접지의  $\pm 400\text{VDC}$  이상 또는 이하여서는 안 됩니다.

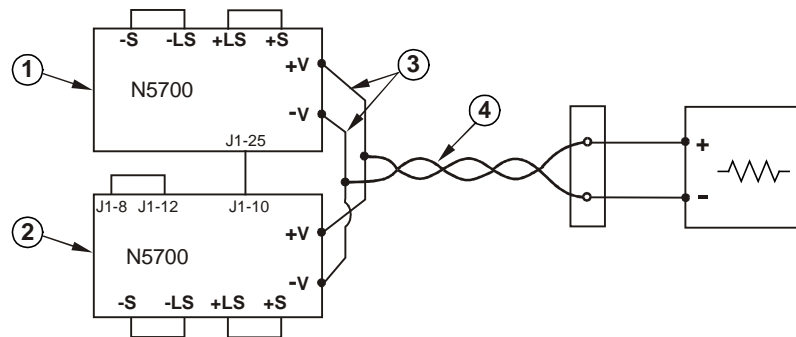
## 병렬 연결

### 주의

정격 전압 및 전류가 동일한 전원 공급기만 병렬로 연결할 수 있습니다.

같은 정격 전압 및 전류의 전원 공급기 4 대를 병렬로 연결하여 최대 4 배의 출력 전류를 얻을 수 있습니다. 다음 그림에는 두 대의 장치를 나타내었지만 최대 4 대까지 동일한 연결 방법이 적용됩니다.

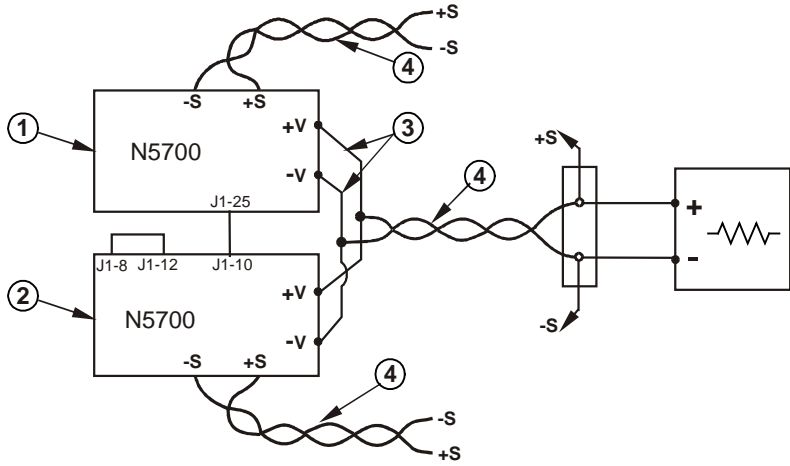
장치 중 하나는 마스터로, 나머지는 슬레이브로 작동합니다. 슬레이브 장치는 마스터 출력 전류를 따르는 제어된 전류 소스로 작동합니다. 원격 작동에서는 마스터 장치만 컴퓨터로 프로그래밍할 수 있으며 슬레이브 장치는 전압, 전류 및 상태 리드백을 위해서만 컴퓨터에 연결할 수 있습니다.



로컬 감지

1 - 마스터 장치. 2 - 슬레이브 장치. 3 - 가능한 짧게. 4 - 꼬임 쌍선.





원격 감지

1 - 마스터 장치. 2 - 슬레이브 장치. 3 - 가능한 짧게. 4 - 꼬임  
쌍선.

## 마스터 장치 설정

앞 그림에 나타낸 것처럼 로컬이나 원격 감지를 위해 감지 회로를 연결합니다. 마스터 장치 출력 전압을 원하는 전압으로 설정합니다. 원하는 로드 전류 한계를 병렬 장치의 수로 나눈 값으로 전류 한계를 프로그래밍합니다. 작동 중에 마스터 장치는 정전압 모드에서 작동하여 프로그래밍된 출력 전압으로 로드 전압을 조절합니다.

## 슬레이브 장치 설정

후면 패널 설정 스위치 SW1 위치 2를 위로 설정합니다. 슬레이브 장치의 J1 핀 10(전류 프로그램)을 마스터 장치의 J1 핀 25(병렬)에 연결합니다. 또한 J1 핀 8 및 J1 핀 12 간에 단락을 연결합니다. 슬레이브 장치의 출력 전압은 마스터 장치의 제어와 혼선되지 않도록 마스터 장치의 출력 전압보다 높게 프로그래밍해야 합니다. 원하는 전류 한계를 병렬 장치의 수로 나눈 값으로 각 장치의 전류 한계를 프로그래밍합니다.

## 과전압 및 과전류 보호 설정

마스터 장치의 과전압 보호를 원하는 레벨로 프로그래밍합니다. 슬레이브 장치의 과전압 레벨은 마스터 장치보다 높은 값으로 프로그래밍하십시오. 마스터 장치는 중단되었을 때 슬레이브 장치를 0의 출력 전압으로 프로그래밍합니다.

필요한 경우 과전류 보호를 마스터 장치에서만 사용할 수 있습니다. 마스터 장치는 중단되었을 때 슬레이브 장치를 0의 출력 전압으로 프로그래밍합니다.

## 직렬 연결

### 경고

#### 감전 위험!

최대 60VDC 정격 출력 모델의 경우 출력의 어떤 지점도 새시 접지의  $\pm 60\text{VDC}$  이상 또는 이하여서는 안 됩니다.

60VDC 이상의 정격 출력 모델인 경우 양극 출력의 어떤 지점도 새시 접지의  $\pm 60\text{VDC}$  이상 또는 이하여서는 안 됩니다.

60VDC 이상의 정격 출력 모델인 경우 음극 출력의 어떤 지점도 새시 접지의  $\pm 400\text{VDC}$  이상 또는 이하여서는 안 됩니다.

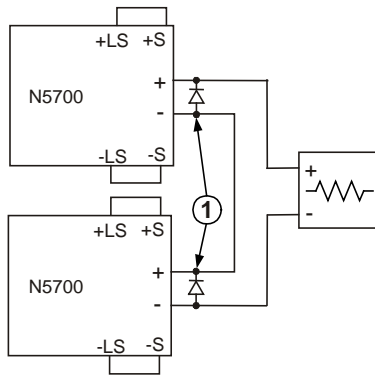
### 주의

정격 전압 및 전류가 동일한 전원 공급기만 직렬로 연결할 수 있습니다.

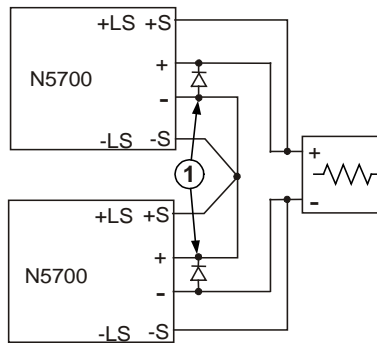
같은 정격 전압 및 전류의 전원 공급기 두 대를 직렬로 연결하여 최대 두 배의 출력 전압을 얻을 수 있습니다. 직렬 회로의 각 요소에서 흐르는 전류는 동일하기 때문에 직렬로 연결된 출력의 정격 전류는 동일해야 합니다.

켜기 과정이나 한 대의 장치가 꺼질 때의 역전압을 방지하기 위해 각 출력에서 다이오드를 병렬로 연결하는 것이 좋습니다. 각 다이오드의 정격은 최소한 전원 공급기의 정격 출력 전압 및 출력 전류는 되어야 합니다.

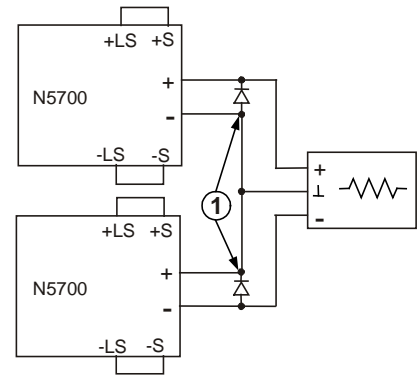
다음 그림은 로컬 및 원격 감지에서의 직렬 연결을 보여줍니다. 직렬 연결된 전원 공급기가 양극 및 음극 출력으로 구성된 것도 보여줍니다.



로컬 감지



원격 감지



양극 및 음극 출력

1 - 다이오드는 사용자가 제공합니다.

## 정상 작동

### 정전압 모드

정전압 모드에서 전원 공급기는 로드에게 맞게 로드 전류를 변화시켜가며 선택된 값으로 출력 전압을 조절합니다. 전원 공급기가 정전압 모드에서 작동할 때는 전면 패널의 CV 표시기에 불이 들어옵니다.

출력이 활성화되어 있을 때는 전압 노브를 돌리기만 하여 출력 전압을 프로그래밍합니다. 출력이 해제되었을 때는 LIMIT 버튼을 누른 다음 전압 노브를 돌립니다. 조절을 마치면 DC 전압 디스플레이에 5 초 동안 프로그래밍된 전압이 표시된 다음 OFF 가 표시됩니다.

전압 노브를 저 분해능과 고 분해능으로 설정할 수 있습니다. FINE 버튼을 눌러 분해능을 높입니다. FINE 표시기가 켜집니다.

#### 참고

출력 전압을 원하는 값으로 조절할 수 없는 경우, 전원 공급기가 전류 제한 상태에서 작동하고 있을 수 있습니다. 로드 상태와 전류 한계 설정을 점검하십시오. 최대 및 최소 전압 설정은 과전압 보호 및 저전압 한계 설정으로 제한될 수도 있습니다.

### 정전류 모드

정전류 모드에서 전원 공급기는 로드에게 맞게 로드 전압을 변화시켜가며 선택된 값으로 출력 전류를 조절합니다. 전원 공급기가 정전류 모드에서 작동할 때는 전면 패널의 CC 표시기에 불이 들어옵니다.

출력이 활성화되고 정전류 모드에 있을 때는 전류 노브를 돌리기만 하여 전류 한계를 프로그래밍합니다. 출력이 정전압 모드에 있을 때는 LIMIT 버튼을 누른 다음 전류 노브를 돌립니다. 조절을 마치면 DC AMPS 디스플레이에 5 초 동안 프로그래밍된 전류가 표시된 다음 실제 출력 전류가 표시됩니다.

출력이 해제되었을 때는 LIMIT 버튼을 누른 다음 전류 노브를 돌립니다. 조절을 마치면 DC AMPS 디스플레이에 5 초 동안 프로그래밍된 전류가 표시된 다음 출력이 꺼져 있기 때문에 아무 것도 표시되지 않습니다.

전류 노브를 저 분해능과 고 분해능으로 설정할 수 있습니다. FINE 버튼을 눌러 분해능을 높입니다. FINE 표시기가 켜집니다.

### CV/CC 모드 교차

전원 공급기가 작동하는 모드는 전압 설정, 전류 한계 설정 및 로드 저항에 따라 결정됩니다. 전원 공급기가 정전압 모드에 있고 로드 전류가 전류 한계 설정 이상으로 증가하면 전원 공급기가 정전류 모드로 전환합니다. 로드 전류 제한 설정 이하로 감소하면 전원 공급기가 정전압 모드로 전환됩니다.

## CV/CC 신호

### 주의

CV/CC 신호를 30VDC 이상의 전압 소스에 연결하지 마십시오. CV/CC 신호를 항상 싱크 전류를 10mA 이하로 제한하는 직렬 저항기가 있는 전압 소스에 연결하십시오.

J1 커넥터에서 제공되는 CV/CC 신호는 전원 공급기의 작동 모드를 나타냅니다. CV/CC 신호는 30V 병렬 제너 (zener)가 J1 핀 13에 있고 J1 핀 12에서 공통을 참조하는 개방된 컬렉터 출력입니다. J1 핀 12는 -S 단자에 내부적으로 연결됩니다. 전원 공급기가 정전압 모드에서 작동할 때 CV/CC 출력은 열려 있습니다. 전원 공급기가 정전류 모드에서 작동할 때 CV/CC 신호 출력은 낮음 (0 - 0.6V)이고 최대 싱크 전류는 10mA입니다.

## 보호 기능

### 과전압 보호

과전압 보호는 출력 전압이 OVP 한계 설정을 초과하는 경우 전원 공급기 출력을 차단합니다.

OVP 레벨을 설정하려면 OVP/UVL 버튼을 눌러 디스플레이에 OVP를 표시합니다. 디스플레이에 OVP 설정이 표시됩니다. 전압 노브를 돌려 OVP 레벨을 조절합니다. 디스플레이에 다시 5초 동안 OVP와 설정값이 표시된 다음 이전 상태로 돌아갑니다. 과전압 상태가 발생하면 출력이 해제되고 디스플레이에 OVP가 표시되고 PROT 표시기가 깜박입니다.

### 저전압 한계

저전압 한계는 출력 전압을 특정 한계 이하로 조절하지 못하도록 합니다.

UVL 설정은 출력이 활성화 (켜짐) 또는 해제 (꺼짐)되어 있을 때 수행할 수 있습니다. UVL 레벨을 설정하려면 OVP/UVL 버튼을 두 번 눌러 디스플레이에 UVL을 표시합니다. 디스플레이에 UVL 설정이 표시됩니다. 전압 노브를 돌려 UVL 레벨을 조절합니다. 디스플레이에 다시 5초 동안 UVL과 설정값이 표시된 다음 이전 상태로 돌아갑니다.

### 과전류 보호

과전류 보호는 로드 전류가 전류 한계 설정을 초과하는 경우 전원 공급기 출력을 차단합니다.

과전류 보호를 적용하려면 OCP/488 버튼을 눌러 OCP 표시기를 표시합니다.

이 기능을 설정하면 정전압 모드에서 정전류 모드로 전환될 때 과전류 보호가 활성화됩니다. 과전류 보호 이벤트가 발생하면 출력이 해제되고 디스플레이에 OCP가 표시되고 PROT 표시기가 깜박입니다.

## 과열 보호

과열 보호를 설정하면 내부 온도가 너무 높을 때 출력이 차단됩니다. OTP 상태가 발생하면 출력이 해제되고 디스플레이에 O7P 가 표시되고 PROT 표시기가 깜박입니다.

## 전면 패널 잠금

전면 패널 조작 스위치를 실수로 움직이지 않도록 잠글 수 있습니다. LIMIT 버튼을 누르고 있으면 전면 패널 잠금과 전면 패널 잠금 해제 사이에서 전환됩니다. 디스플레이는 LFP 와 UFP 가 번갈아 바뀝니다. 이 모드 중 하나가 표시될 때 LIMIT 버튼을 놓으면 해당 모드가 선택됩니다.

잠금 해제 모드에서는 전면 패널 제어가 활성화되어 전원 공급기 파라미터를 프로그램하고 감시할 수 있습니다.

잠금 모드에서는 전압 및 전류 노브, OCP/488 버튼 및 OUT ON 버튼이 사용 해제됩니다. 디스플레이에 LFP 가 표시되어 전면 패널이 잠겼음을 나타 냅니다. OVP/UVL 버튼은 OVP 와 UVL 설정을 미리 보도록 활성 상태로 유지됩니다. LIMIT 버튼도 출력 전압과 전류 설정을 미리 보거나 전면 패널의 잠금을 해제하도록 활성 상태로 남습니다.

## 출력 On/Off 제어

### OUT ON 버튼

OUT ON 버튼은 출력을 설정 또는 해제합니다. 해제하면 출력 전압과 전류가 0 이 되고 디스플레이에 OFF 가 표시됩니다.

### 출력 차단 단자

출력 차단 (SO) 단자는 J1 커넥터에서 사용하여 전원 공급기 출력을 설정 또는 해제할 수 있습니다. 이 기능은 에지로 트리거됩니다. J1 핀 15 는 차단 입력이고 내부적으로 연결되는 핀 2 및 핀 3 은 신호 공통입니다. 모든 핀은 전원 공급기 출력으로부터 광학적으로 절연됩니다. 차단 입력은 2.5V - 15V 신호 또는 개방/단락 접점을 받아들여 출력을 설정 또는 해제합니다. 차단 제어 논리는 SW1 설정 스위치 5 로 선택합니다.

차단 입력에서 켜기-끄기 전환이 감지되면 차단 기능이 J1 핀 15 에 인가된 신호 레벨이나 개방/단락에 따라 출력을 설정 또는 해제합니다. 차단 기능으로 출력이 해제되면 디스플레이에 SO 가 표시되어 출력이 해제되었음을 나타냅니다.

SW1 스위치 5	SO 신호 레벨	출력	디스플레이
Down (기본값)	2 - 15V 또는 개방	켜짐	전압/전류
	0 - 0.4V 또는 단락	꺼짐	SO
Up	2 - 15V 또는 개방	꺼짐	SO
	0 - 0.4V 또는 단락	켜짐	전압/전류

## 설정/해제 단자

### 주의

장치의 잠재적 손상을 방지하기 위해 설정+ 또는 설정- 단자를 양극 또는 음극 출력 단자에 연결하지 마십시오.

설정/해제 단자는 J1 커넥터에서 사용하여 전원 공급기 출력을 설정 또는 해제할 수 있습니다. 이 기능은 레벨로 트리거됩니다. J1 핀 1 및 핀 14 간에 간단히 스위치나 릴레이를 연결하십시오. 이 기능은 SW1 설정 스위치 9로 활성화됩니다.

이 핀은 개방되었을 때 출력을 해제합니다. 출력이 해제되면 전면 패널의 PROT 표시기가 깜박입니다.

SW1 스위치 9	ENA+/ENA- 핀	출력	디스플레이	Prot 표시기
Down (기본값)	비활성	켜짐	전압/전류	꺼짐
Up	개방	꺼짐	ENA	점멸
	단락	켜짐	전압/전류	꺼짐

## 전원 공급기 OK 신호

J1 커넥터의 전원 공급기 OK 신호는 전원 공급기의 장애 상태를 나타냅니다. J1 핀 16은 TTL 출력 신호입니다. 내부적으로 연결되는 핀 2 및 3은 신호 공통입니다. 모든 핀은 전원 공급기 출력으로부터 광학적으로 절연됩니다. 장애가 없으면 전원 공급기 OK가 높음이고 최대 소스 전류는 2mA입니다. 장애가 생기면 전원 공급기 OK가 낮음이 되고 최대 싱크 전류는 1mA입니다. 다음 장애가 있을 때 이 신호가 낮음으로 설정됩니다.

과전압 보호	설정/해제 신호 참
과전류 보호	차단 신호 참
과열 보호	인터페이스 장애
AC 라인 장애	출력 꺼짐

## 안전 시작 및 자동 재시작

전원 공급기를 켤 때 마지막 작동 설정 (자동 재시작)이나 초기화 설정 (안전 시작)이 적용되도록 프로그래밍할 수 있습니다. OUT ON 버튼을 누르고 있으면 안전 시작과 자동 재시작 사이에서 선택할 수 있습니다. 디스플레이에는 SAF와 AUT가 3초마다 계속해서 번갈아 표시됩니다. 이 모드 중 하나가 표시될 때 OUT ON 버튼을 놓으면 해당 모드가 선택됩니다.

안전 시작 모드에서는 장치가 초기화 설정으로 켜집니다. 출력이 해제되고 출력 전압과 전류는 0이 됩니다.

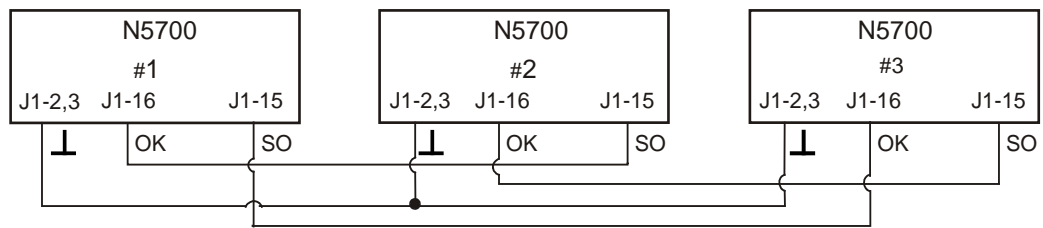
자동 재시작 모드에서는 전원 공급기가 마지막 켜질 때 저장된 작동 설정을 복원합니다 (다음 목록 참조). 마지막 설정에 따라 출력이 설정 또는 해제됩니다.

출력 On/Off 상태	UVL 레벨
출력 전압 설정	OCP 설정
출력 전류 설정	잠금/잠금 해제된 전면 패널
OVP 레벨	시작 모드

## 다중 장치 종료

장치 중 하나에서 장애 조건이 발생했을 때 모든 장치를 종료하도록 다중 전원 공급기 시스템을 구성할 수 있습니다. 다중 장치 종료를 설정하려면 SW1 설정 스위치 5가 Down 위치에 있어야 합니다. 이 설정으로 다른 스위치는 영향을 받지 않습니다.

한 장치에서 장애가 발생하면 전원 공급기 OK 신호가 낮음으로 설정되고 디스플레이에 장애가 표시됩니다. 다른 장치는 디스플레이에 SO가 표시되면서 종료됩니다. 장애 조건이 제거되면 안전 시작 또는 자동 재시작 설정에 따라 모든 장치가 복구됩니다.



## 출력 전압 및 전류의 아날로그 프로그래밍

### 아날로그 프로그래밍 제어 단자

J1 커넥터 핀 8은 TTL 신호나 개방/단락 접점 스위치 (핀 12 참조)를 받아 들여 출력 전압 및 전류의 로컬 또는 아날로그 프로그래밍 중에서 선택합니다. 이 기능은 SW1 설정 스위치 1 및 2로 설정 또는 해제합니다.

J1 커넥터 핀 21은 전원 공급기가 로컬 모드인지 또는 아날로그 모드인지를 나타내는 개방된 컬렉터 출력입니다. 이 출력을 사용하려면 풀업 저항을 최대 30VDC의 전압 소스에 연결합니다. 출력이 낮음 상태에 있을 때 싱크 전류가 5mA 이하가 되도록 풀업 저항을 선택하십시오.

SW1 스위치 1 및 2	J1 핀 8 기능	J1 핀 21 신호	출력 전압/전류 제어
모두 Down (기본값)	효과 없음	개방	로컬
둘 중 하나 또는 모두 Up	0 또는 단락	0~0.6V	아날로그
	1 또는 개방	개방	로컬

## 출력 전압 및 전류의 전압 프로그래밍

### 주의

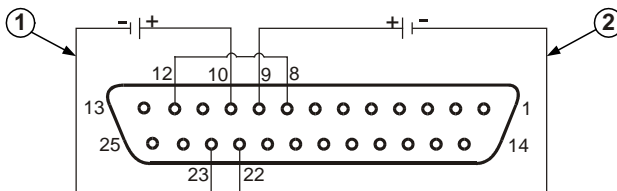
J1 핀 12, 핀 22 및 핀 23 은 음극 감지 단자에 내부적으로 연결됩니다. 이 핀을 음극 감지 단자 이외에 어떤 단자에도 참조시키지 마십시오. 장치가 손상될 수 있습니다.

전원 공급기의 절연을 유지하고 접지 루프를 방지하려면 아날로그 프로그래밍을 사용하여 장치를 작동할 때 절연된 프로그래밍 소스를 사용하십시오.

0 - 5V 또는 0 - 10V 의 전압 프로그래밍 소스를 사용하여 출력 전압과 전류 한계를 0 에서 전체 범위까지 프로그래밍할 수 있습니다. 다음 표에 따라 SW1 설정 스위치 3 을 설정하여 프로그래밍 전압 범위를 선택합니다. SW1 설정 스위치 1 및 2 는 UP 위치로 설정하고 스위치 7 및 8 은 DOWN 으로 설정합니다.

SW1 스위치 3	전압 프로그램 (J1 핀 9)	전류 프로그램 (J1 핀 10)
Down (기본값)	0 - 5V	0 - 5V
Up	0 - 10V	0 - 10V

다음 그림에 나타낸 것처럼 프로그래밍 소스를 J1 의 결합 플러그에 연결합니다. 전압 소스에 올바른 극성을 지키십시오. 또한 J1 핀 8 및 J1 핀 12 사이에서 단락을 연결합니다.



1 - 전류 한계 프로그래밍

2 - 출력 전압 프로그래밍

## 출력 전압 및 전류의 저항 프로그래밍

### 주의

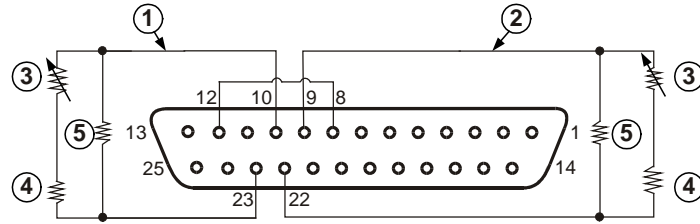
J1 핀 12, 핀 22 및 핀 23 은 음극 감지 단자에 내부적으로 연결됩니다. 이 핀을 음극 감지 단자 이외에 어떤 단자에도 참조시키지 마십시오. 장치가 손상될 수 있습니다.

0 - 5kΩ 또는 0 - 10kΩ 의 저항을 선택하여 출력 전압과 전류 한계를 0 에서 전체 범위까지 프로그래밍할 수 있습니다. 온도 계수가 50ppm 이하인 안정적이고 노이즈가 적은 저항만 사용하십시오. 다음 표에 따라 SW1 설정 스위치 3 을 설정하여 프로그래밍 저항 범위를 선택합니다. SW1 설정 스위치 1, 2, 7 및 8 을 모두 UP 위치로 선택해야 합니다.

SW1 스위치 3	전압 프로그램 (J1 핀 9)	전류 프로그램 (J1 핀 10)
Down (기본값)	0 - 5kΩ	0 - 5kΩ
Up	0 - 10kΩ	0 - 10kΩ



다음 그림에 나타난 것처럼 프로그래밍 저항을 J1의 결합 플러그에 연결합니다. 가변 저항을 사용하면 전범위에 걸쳐 출력을 조절할 수 있습니다. 가변 저항과 직렬/병렬 저항을 함께 사용하면 제한된 범위에 걸쳐 출력을 제어할 수 있습니다. 또한 J1 핀 8 및 J1 핀 12 간에 단락을 연결합니다.



- 1 - 전류 한계 프로그래밍
- 2 - 출력 전압 프로그래밍
- 3 - 프로그래밍 저항
- 4 - 옵션, 하한 설정
- 5 - 옵션, 상한 설정

### 출력 전압과 전류의 외부 감시

J1 커넥터도 출력 전압과 전류를 감시하기 위한 아날로그 신호를 제공합니다. SW2 설정 스위치 4를 사용하여 0-5V 또는 0-10V 사이에서 전압 범위를 선택합니다. 감시 신호는 전원 공급기의 정격 전압과 전류의 0~100%를 표시합니다. 모니터 출력의 직렬 출력 저항은 500Ω입니다. 감지 회로의 입력 저항은 500kΩ 이상이어야 정확도가 좋지 않습니다.

SW1 스위치 4	전압 범위	J1 신호 연결	신호 기능
Down (기본값)	0-5V	J1 핀 11	전압 모니터
		J1 핀 24	전류 모니터
Up	0-10V	J1 핀 11	전압 모니터
		J1 핀 24	전류 모니터

J1 핀 12는 J1 핀 11 및 24에 대한 신호 공통입니다.

### 원격 인터페이스의 구성과 사용

키사이트 N5700 DC 전원 공급기는 GPIB, USB 및 LAN의 3가지 인터페이스를 사용한 원격 인터페이스 통신을 지원합니다. 3가지 인터페이스 모두 전원을 켤 때 활성화됩니다. 원격 인터페이스의 구성과 사용에 대한 내용은 기기와 함께 제공된 *사용 설명서*를 참조하십시오.



이 정보는 사전 통보없이 변경 될 수 있습니다.

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