Keysight Series N8700 System DC Power Supply

User's Guide

KEYSIGHT TECHNOLOGIES

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Manual Editions

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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 I 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


Do not dispose in domestic household waste.

In this Book

This User's Manual contains the operating instructions, installation instructions, and specifications of the Keysight Technologies Series N8700 3.3kW and 5kW 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 N8700 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 N8700 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
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/N8700 to get the latest version of the manual.

Contents

1
Quick Reference

This chapter concisely describes the Keysight Technologies Series N8700 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.

KEYSIGHT TECHNOLOGIES

The Keysight N8700 DC Power Supplies – At a Glance

The Keysight Technologies Series N8700 System DC Power Supplies are general-purpose, 2U (two rack units) high, switching power supplies that are available with a wide variety of output voltage and current ratings. There are both 3.3 kW and 5 kW models.

These power supplies are power-factor corrected and have flexible AC input voltage options. 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.
- Active power factor correction.
- Fan speed control for low noise and extended fan life.

Programmable Functions

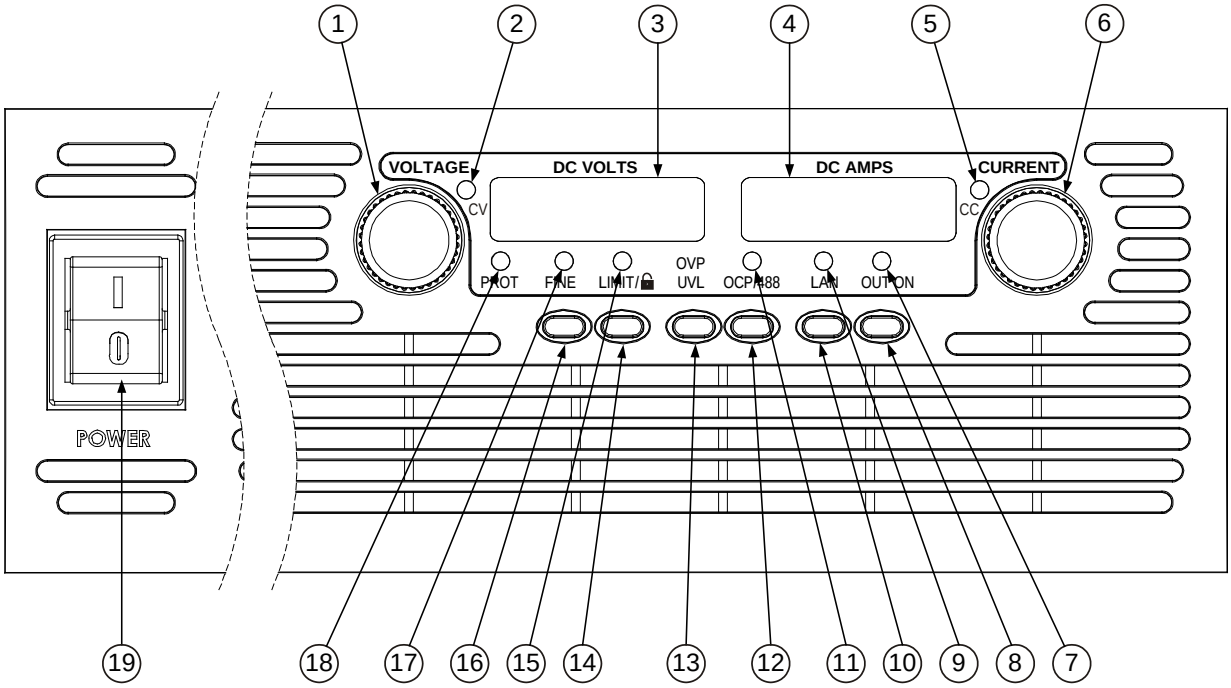
- Output voltage and current setting.
- Output voltage and current measurement.
- Output voltage and current trigger setting.
- Output On/Off control.
- Over-current protection setting.
- Over-voltage protection setting and readback.
- Under-voltage limit setting and readback.
- Start-up mode (either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

Model Ratings

3.3 kW Models [Note 1, 2]			5 kW Models [Note 1, 2]		
Model	Voltage Range	Current Range	Model	Voltage Range	Current Range
N8731A	0 – 8V	0 – 400A	N8754A	0 – 20V	0 – 250A
N8732A	0 – 10V	0 – 330A	N8755A	0 – 30V	0 – 170A
N8733A	0 – 15V	0 – 220A	N8756A	0 – 40V	0 – 125A
N8734A	0 – 20V	0 – 165A	N8757A	0 – 60V	0 – 85A
N8735A	0 – 30V	0 – 110A	N8758A	0 – 80V	0 – 65A
N8736A	0 – 40V	0 – 85A	N8759A	0 – 100V	0 – 50A
N8737A	0 – 60V	0 – 55A	N8760A	0 – 150V	0 – 34A
N8738A	0 – 80V	0 – 42A	N8761A	0 – 300V	0 – 17A
N8739A	0 – 100V	0 – 33A	N8762A	0 – 600V	0 – 8.5A
N8740A	0 – 150V	0 – 22A			
N8741A	0 – 300V	0 – 11A			
N8742A	0 – 600V	0 – 5.5A			

Note 1: Minimum output voltage is ≤ 0.2% of the rated output voltage.
Note 2: Minimum output current is ≤ 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. Press the FINE button to set fine adjustment resolution.

GPIB address: Selects the GPIB address when OCP/488 is pressed and held.

2 – VOLTAGE indicator

Indicates the unit is in constant voltage mode – with the output voltage held constant.

3 – DC VOLTS display

Normally displays the voltage measured at the sense terminals.
- Indicates the programmed voltage setting when the LIMIT button is pressed.
- Indicates either the OVP or UVL setting when the OVP/UVL button is pressed.
- Indicates the GPIB address when the OCP/488 button is pressed and held.
- Indicates the IP and Ethernet address when e LAN button is pressed and held.

4 – DC AMPS display

Normally displays the current measured at the output terminals.
- Indicates the programmed current setting when the LIMIT button is pressed.
- Indicates the IP and Ethernet address when the LAN button is pressed and held.

5 – CURRENT indicator

Indicates the unit is in constant current mode – with output current held constant.

6 – CURRENT knob

Adjusts the output current. Press the FINE button to set fine adjustment resolution.

7 – OUT ON indicator

Indicates the output is enabled or on.

8 – OUT ON button

Output function: Press the OUT ON button to turn the output on or off. Press the OUT ON button to reset the unit and return the output to on after an OVP or OCP event.

Start-Up function: Press and hold the OUT ON button to toggle between the Safe-Start and Auto-Restart modes. The display cycles between SAF and AU7. Releasing the OUT ON button while one of the modes is displayed selects that mode.

9 – LAN indicator Indicates the LAN has been configured and is operating normally. Set another unit on the N8700 unit's Web home page and the LAN indicator blinks to identify that unit.

10 – LAN button View address: Press the LAN button 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). The display returns to normal and the configuration is not changed if the LAN button is not pressed again.

11 – OCP indicator Indicates over-current protection is enabled or on.

12 – OCP/488 button Enable OCP: Press the OCP/488 button to turn over-current protection on. Press the OCP/488 button again to turn over-current protection off.

Reset OCP: Press the OUT ON button to enable the output and re-arm over-current protection following an over-current protection event.

GPIB address: Press and hold the OCP/488 button for three seconds to set the GPIB address with the Voltage knob.

13 – OVP/UVL button OVP function: Press the OVP/UVL button 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 the OVP/UVL button 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 the LIMIT button to display the output voltage and current limit. Settings are shown on the display for five seconds then the display returns to show the actual output voltage and current.

Lock function: Press and hold the LIMIT button to toggle between 'Locked' front panel (LFP) and 'Unlocked' front panel (UFP). 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 Indicates the LIMIT button is pressed.

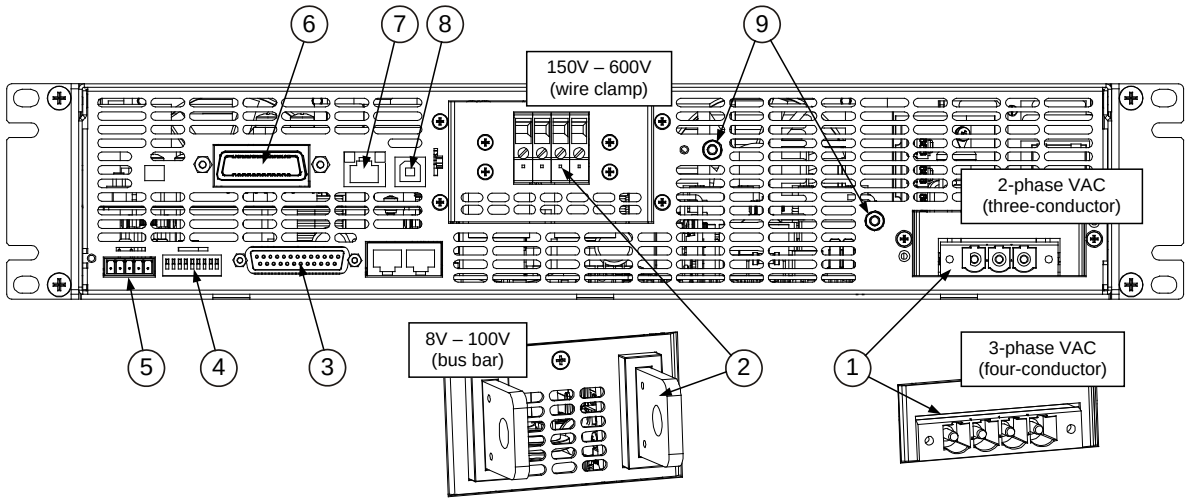
16 – FINE button Sets Fine or Coarse adjustment control for the Voltage and Current knobs.
Press the FINE button to set Fine mode; press again to return to Coarse mode.
- Fine mode: Knobs operate with high resolution.
- Coarse mode: Knobs operate with lower resolution (approximately six turns).

17 – FINE indicator Indicates the unit is in the high resolution 'Fine' adjustment mode.

18 – PROT indicator Blinks when a fault has occurred.
OVP, OCP, OTP, Enable fail, and AC fail detection will cause the PROT (protection) indicator to blink. The PROT indicator may blink and the display will 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

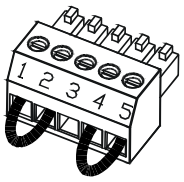


1 – AC input connector	Header with mating plug-in connector for both the 3.3 kW and 5 kW output models. A 3-conductor plug is provided for single-phase VAC. A 4-conductor plug is provided for 3-phase VAC.
2 – DC output connector	Wire clamp connector is used for 150V, 300V and 600V models. Bus bars are used for 8V to 100V models.
3 – 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)
4 – 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)
5 – 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)
6 – GPIB connector	Connector for connecting to a GPIB interface. See chapter 4 for setup.
7 – 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.
8 – USB connector	Connector for connecting to a USB interface. See chapter 4 for setup.
9 – Ground screw & nut	M4x8 screws with nut for making chassis ground connections

WARNING SHOCK HAZARD The AC power cable provides a chassis ground through the ground conductor. Be certain that your power source is three-conductor for single-phase models or four-conductor for 3-phase models with the ground conductor (green/yellow) connected to earth ground.

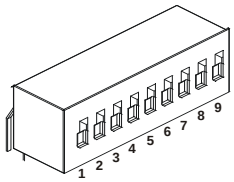
J2 Sense Connector

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



The factory-shipped configuration is shown in the figure.

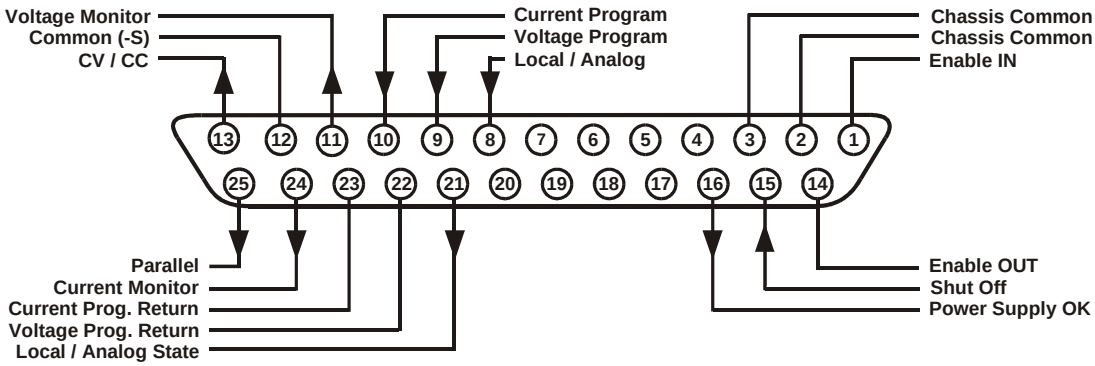
SW1 Setup Switch



The factory-shipped setting is Down for all switches.

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

J1 Analog Programming Connector



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

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

2
Installation

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.

KEYSIGHT TECHNOLOGIES

General Information

Models

3.3 kW Models	5 kW Models
N8731A – N8739A	N8754A – N8759A
N8740A – N8742A	N8760A – N8762A

Items Supplied

Item	Description
Power Cord	A power cord appropriate for your location. Units are supplied with unterminated power cords.
Strain relief assembly	A strain relief assembly for unterminated power cords.
AC input cover	A cover for the AC input on which the strain relief assembly is mounted.
Analog connector	A DB25 subminiature connector plug for analog control connections.
Shield assembly	A safety shield appropriate for the output terminal connections (either wire clamp or bus bar).
Hardware	Nuts, washers, and bolts for connecting load leads to output bus bars (only used for 8V to 100V 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 I 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.

Refer to all WARNINGS, CAUTIONS, and NOTES in the "Connecting the Line Cord" section prior to connecting the unit to an AC source.

Environment

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

The environmental conditions, dimensions of the instrument, as well as an outline diagram are given in Appendix A. 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 N8700 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.

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.

Bench Installation

Attach the four plastic feet that are supplied with the unit when the instrument is mounted on a surface or when units are stacked without rack support. When using the plastic feet, a maximum of three units can be stacked. You must allow for free airflow into the front of the unit and out of the back of the unit. (see "Airflow").

WARNING **CONNECTION TO AC SOURCE The power supply must be connected to the AC mains through a protective device such as a circuit breaker or fuse with a rating as described under "Connecting the Line Cord". The line cord cannot be used as a disconnect device for the power supply.**

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.

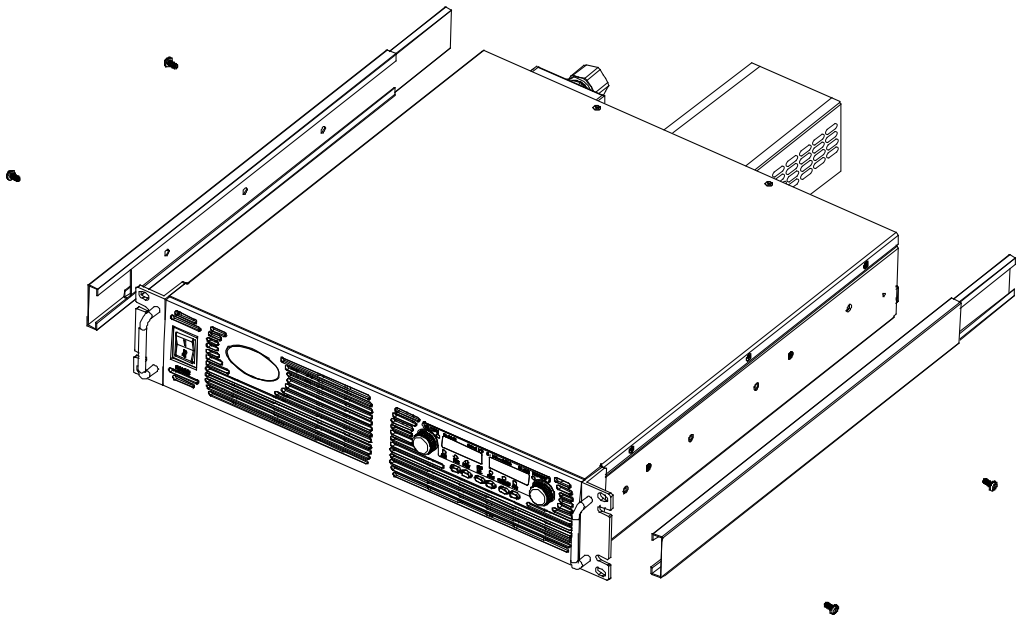
Do not block the air intake at the front, or the exhaust at the rear of the unit.

The Keysight N8700 power supplies can be mounted in a standard 19-inch rack panel or cabinet. They are designed to fit in two rack units (2U) 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. Rack mount slides can be attached to the unit when installing the unit in a standard 19-inch equipment rack. Use the Keysight N5740A Rack-Mount Slide Kit and refer to the following figure for assembly instructions. Use two #10-32 x 3/8 in (max.) screws on 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 cable provides a chassis ground through the ground conductor. Be certain that the power cable has the ground conductor connected to earth ground at the source and instrument AC input connector.

FIRE HAZARD Use only the power cable that was supplied with your instrument. Using other types of power cables may cause overheating of the power cable and result in fire.

WARNING CONNECTION TO AC SOURCE The power supply must be connected to the AC mains through a protective device such as a circuit breaker or fuse with ratings as follows:
For single-phase models: 30A maximum per phase
For 3-phase models: 20A maximum per phase

CAUTION Connection of either a 3.3 kW or 5 kW power supply to an AC power source must be made by a qualified electrician in accordance with local electrical codes.

The POWER on/off switch is not the main disconnect device and does not completely disconnect all circuits from the AC mains. A disconnect device, either a switch or circuit breaker for permanent or multi-phase configurations must be provided in the final installation.

The disconnect device must comply with UL/CSA/EN 61010-1 requirements. It shall be in close proximity to the equipment, shall be easily accessible, and shall be marked as the disconnect device for this equipment. The disconnect device must meet the input ratings requirements listed on the INPUT RATING label located on the top cover of each unit. Refer to "AC Input" In Appendix A for details.

One of the following unterminated power cables is provided with each unit. If required, connect an appropriate locking-type power plug to the end of the power cable.

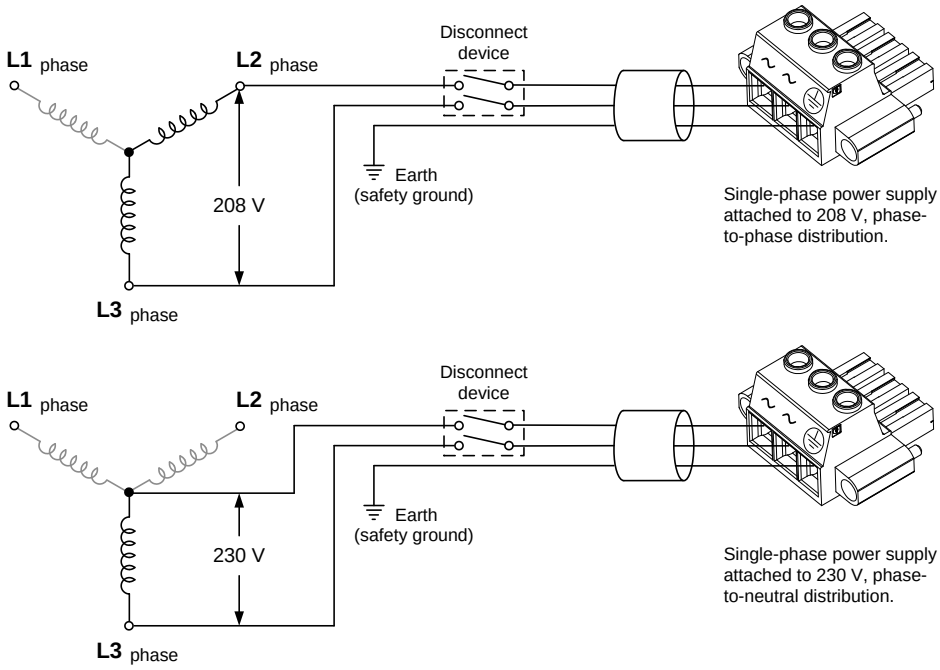
Cable Option/Part no.	Description	Rating	Wire Size	Length	Approvals
OPT 831, p/n 8121-1949	3.3kW single-phase	300V, 25 A, 60°C	3 x 10 AWG[Note1,3]	2.5 m	UL/CSA
OPT 832, p/n 8121-1331	3.3kW single-phase	250V, 32 A, 60 °C	3 x 4 mm^2 [Note1]	2.5 m	Harmonized
OPT 861, p/n 8121-1946	3.3kW/5kW 3-phase (190-240 VAC nominal)	300V, 25 A, 90 °C	4 x 10 AWG [Note2,3]	2.5 m	UL/CSA
OPT 862, p/n 8121-1948	3.3kW/5kW 3-phase (380-415 VAC nominal)	450V, 20 A, 70 °C	4 x 2.5 mm^2 [Note2]	2.5 m	Harmonized

Note 1: 2-wire plus one green/yellow safety ground conductor
Note 2: 3-wire plus one green/yellow safety ground conductor
Note 3: 10 AWG corresponds to 4mm^2

WARNING CONNECTION TO AC MAINS Applying incorrect AC mains voltage or incorrectly wiring to the AC mains will damage the power supply and void the warranty.

Single-phase mains connections for 3.3 kW units

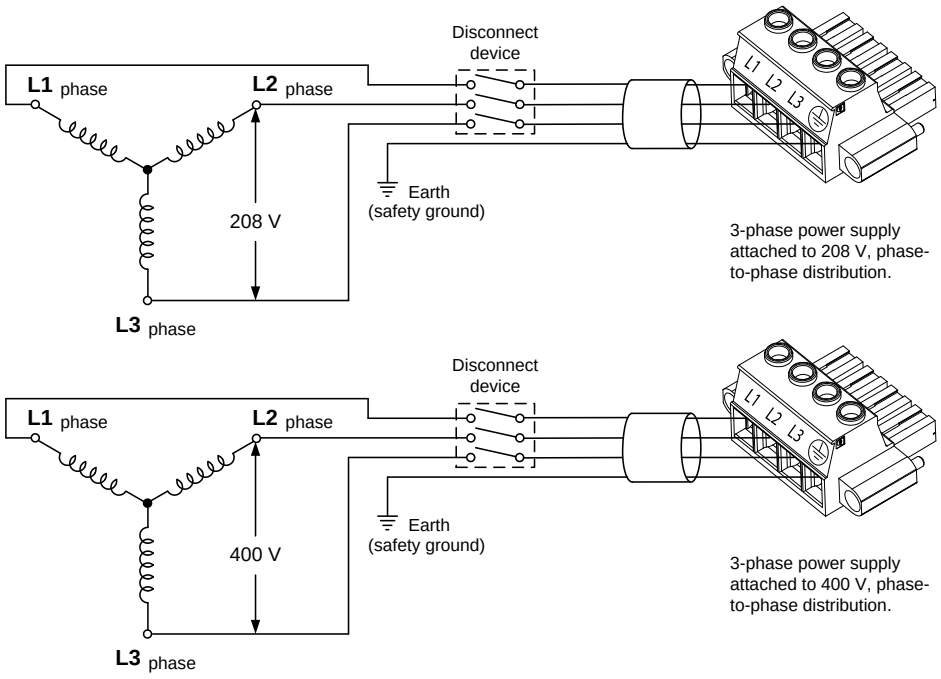
Option 230 units wired for nominal AC input
190 – 240 VAC



3-phase mains connections for 3.3 kW and 5 kW units

Option 208 units wired for nominal AC input
190 – 240 VAC

Option 400 units wired for nominal AC input
380 – 415 VAC



Input Connections for 3.3 kW and 5 kW units

The AC input connector is located on the rear panel. It is a 3-terminal wire clamp for 3.3 kW single-phase units, or a 4-terminal wire clamp for 3.3 kW and 5 kW 3-phase units. Input voltage and current ratings are as follows:

Unit	Nominal AC Input	Input Current @ 100% load	Frequency
3.3 kW single-phase	190 – 240 VAC	23 – 24 A max.	50/60 Hz
3.3 kW 3-phase	190 – 240 VAC 380 – 415 VAC	13.6 – 14.5 A max. 6.8 – 7.2 A max.	50/60 Hz 50/60 Hz
5 kW 3- phase	190 – 240 VAC 380 – 415 VAC	21 – 22 A max. 10.5 – 12 A max.	50/60 Hz 50/60 Hz

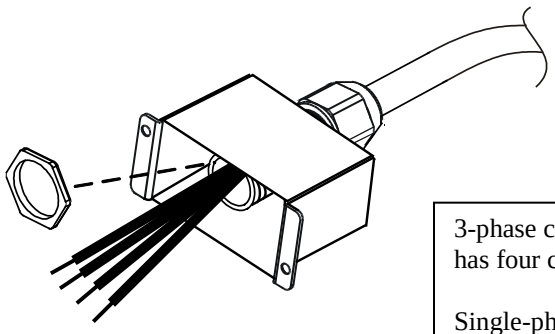
NOTE The AC input line voltage rating is permanently built into the unit and cannot subsequently be changed.

Connect the cable to the AC input connector as follows:

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

2 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. Tighteming torque: 17 in-lb (23 Nm).

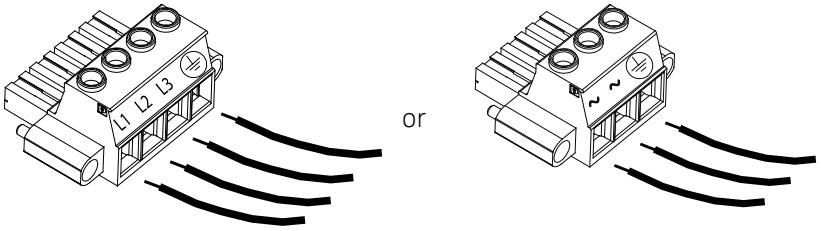
3 Slide the wire compression nut over the AC cable. Insert the stripped wires through the strain relief base until the outer cable jacket is flush with the inside edge of the base. Place a wrench on the base to keep it from turning. Now tighten the compression nut to the base while holding the cable in place. Tightening torque: 14 – 16.2 in-lb (19 – 22 Nm). Refer to the following figure.



3-phase cable (shown) has four conductors.

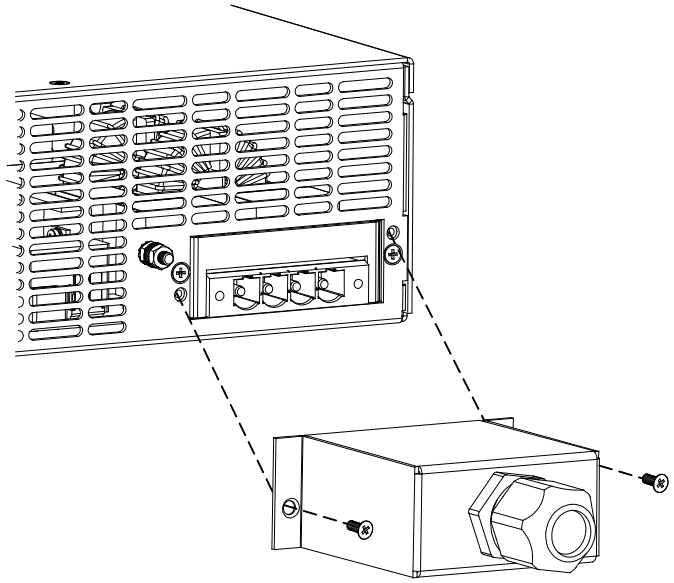
Single-phase cable has three conductors.

4 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 screws securely as indicated in the following figures. Ensure that you have the green/yellow ground conductor connected to the ground terminal on the connector. Plug the connector onto the rear panel header and secure it with the side screws. Screw tightening torque: 10.7 – 13.4 in-lb (1.2 – 1.5 Nm).



Plug Type:	PC 6/4-STF-10,16 or PC 6/3-STF-10,16 Phoenix
Wire Size:	AWG 18 to AWG 8
Stripping Length:	12 mm (0.5 in.)
Torque:	10.7 – 13.4 in-lb (1.2 – 1.5 Nm)

5 Route the wires inside the cover to prevent pinching while sliding the cover towards the rear panel for attachment. Fasten the cover to the unit using the M3 x 8mm flat head screws provided. Screw tightening torque: 4.8 in-lb (0.54 Nm). Refer to the following figure.



Connecting the Load

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

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
- Load wire voltage drop
- Noise and impedance effects of the load wiring

Wire Size

WARNING FIRE HAZARD To satisfy safety requirements, load wires must be large enough not to overheat when carrying the maximum short-circuit current of the power supply. If there is more than one load, then any pair of load wires must be capable of safely carrying the full-rated current of the supply.

Paralleled load wires may be required for larger-ampacity power supplies.

The following table lists the characteristics of AWG (American Wire Gauge) copper wire.

AWG	equivalent area in mm^2	nearest Metric wire size	Ampacity Note 1	Resistance (Ω/1000 feet) Note 2
18	0.823	1.0 mm^2	14	6.385
16	1.31	1.5 mm^2	18	4.016
14	2.08	2.5 mm^2	25	2.526
12	3.31	4 mm^2	30	1.589
10	5.26	6 mm^2	40	0.9994
8	8.37	10 mm^2	60	0.6285
6	13.30	16 mm^2	80	0.3953
4	21.15	25 mm^2	105	0.2486
2	33.62	35 mm^2	140	0.1564
1/0	53.48	70 mm^2	195	0.0983
2/0	67.43	70 mm^2	225	0.0779
3/0	84.95	95 mm^2	260	0.0618

Note 1. Ampacity is based on 30 °C ambient temperature with the conductor rated at 60 °C. For ambient temeratures other than 30 °C, multiply the above ampacities by the following constants:

Temp (°C)	Constant	Temp (°C)	Constant
21-25	1.08	31-35	0.91
26-30	1.00	36-40	0.82

Note 2. Resistance is nominal at 20 °C wire temperature.

Along with conductor temperature, you must also consider voltage drop when selecting wire sizes. Although the power supply will compensate for up to 5 volts in each load wire, it is recommended to minimize the voltage drop to less than 1 volt to prevent excessive output power consumption from the power supply and poor dynamic response to load changes.

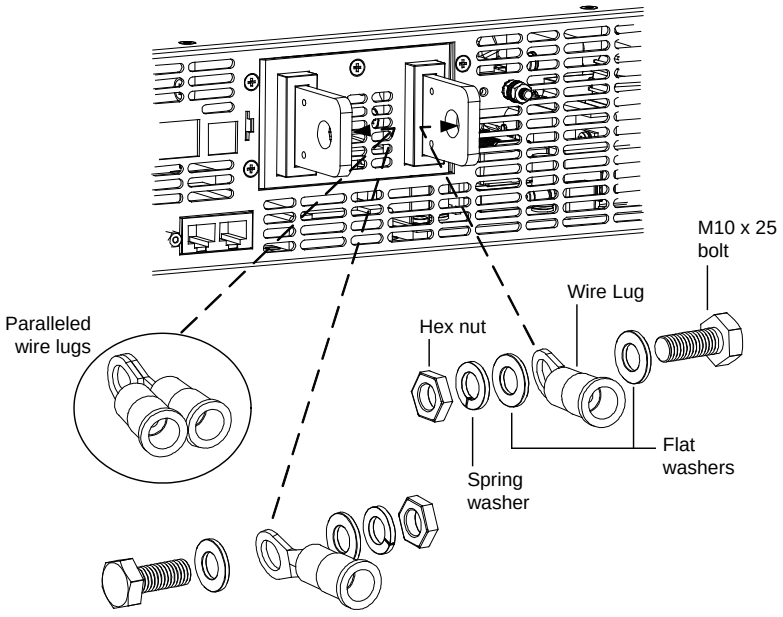
Load Connections for 8V to 100V Models

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.

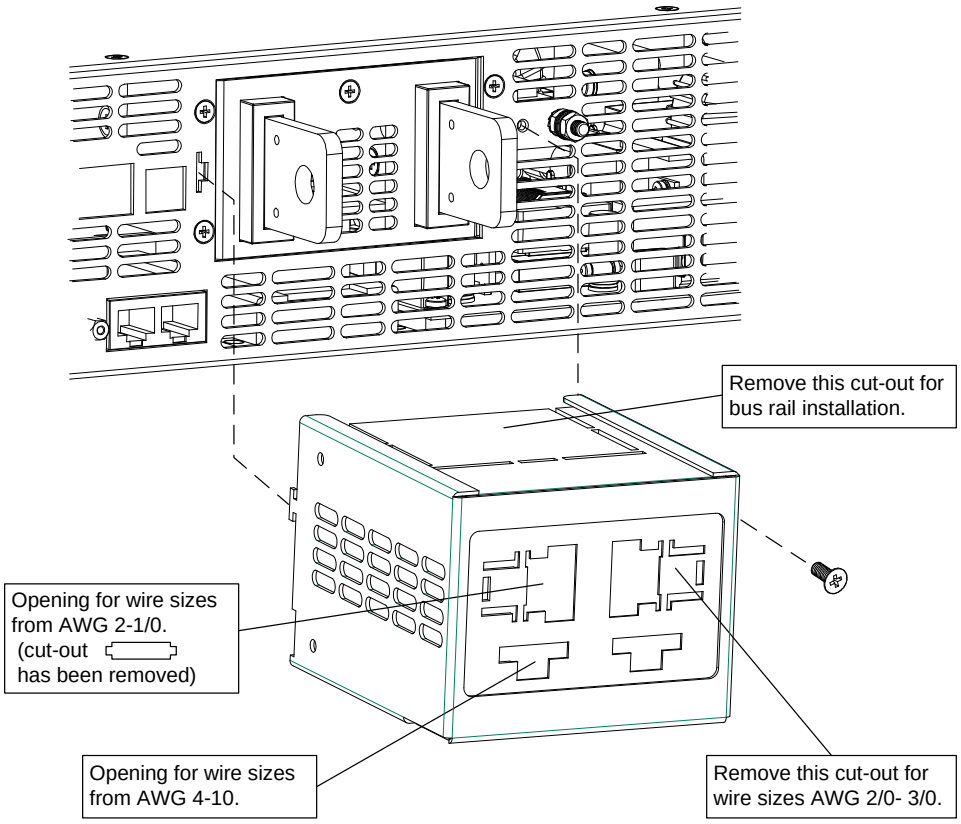
CAUTION Ensure that the load wiring mounting hardware does not short the output terminals. Heavy connecting cables must have some form of strain relief to prevent loosening the connections or bending the bus-bars.

1 As shown in the following figure all load wires should be properly terminated with wire terminal lugs securely attached. DO NOT use unterminated wires for load connections at the power supply. Attach the wire terminals to the *inside* of the bus-bars to ensure enough space for installing the shield.



2 Install the shield after you have finished connecting the load wires. Route the load wires through the openings in the back of the shield.

If necessary, use diagonal cutters and remove the appropriate cut-outs for the larger sized wires as indicated in the following figure. Secure the shield using the tab on the left side and the M3 x 8mm flat head screw on the right side. Screw tightening torque: 4.8 - 5.3 in-lb (0.54 – 0.6 Nm).



Load Connections for 150V, 300V and 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.

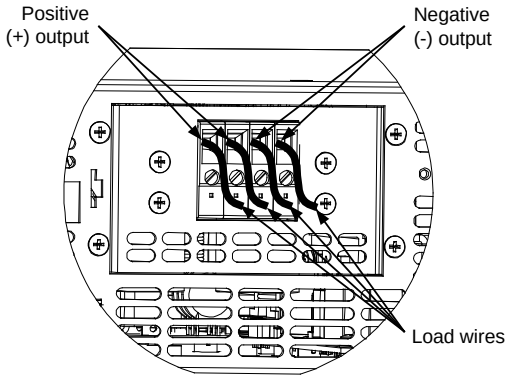
The 150V, 300V and 600V models have a four-terminal wire clamp output connector. The two left terminals are the positive outputs and the two right terminals are the negative outputs. The connector specifications are as follows:

Wire Size:	AWG 18 to AWG 10
Stripping Length:	10 mm (0.4 in)
Torque:	4.4 – 5.3 in-lb (0.5 – 0.6 Nm)

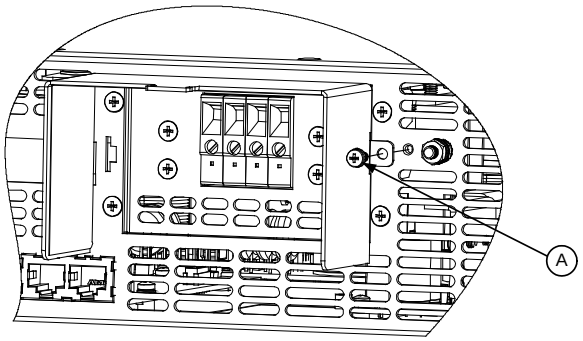
Connect load wires to the power supply output wire clamp connector as follows:

1 Strip wires back approximately 10 mm (0.4 in).

2 Loosen the connector terminal screws and insert the stripped wires into the terminal. Tighten the terminal screws securely.



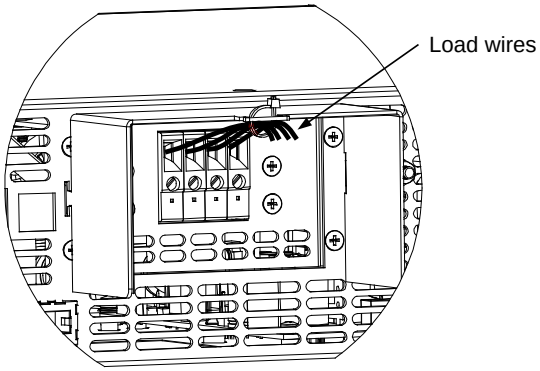
3 Loosen the chassis screw marked A and remove (save).



4 Slide the slotted tab on the protective shield's left side into the chassis slot and lock into place. Insert the right side shield screw A (previously removed) to fix the shield to the chassis. Screw tightening torque: 4.8 - 5.3 in-lb (0.54 - 0.6 Nm).

5 Route the load wires to the tab at the top of the shield. Ensure the wire length inside the shield is long enough to provide proper strain relief.

6 Attach the load wires to the notched shield tab using a tie-wrap or equivalent as shown in the following figure.

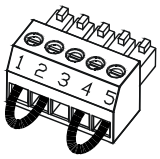


Output Voltage Sensing

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 terminal assignments.

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

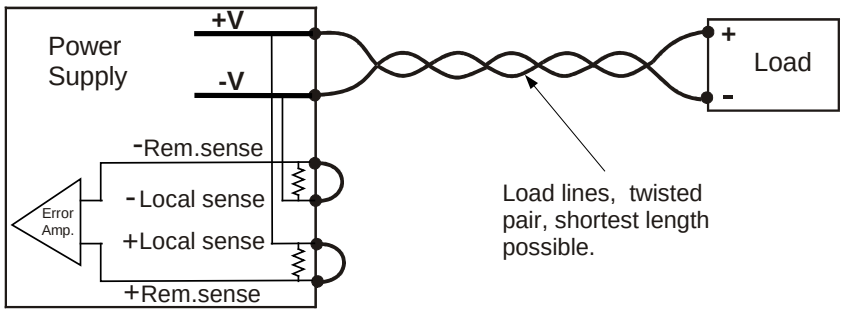


The J2 connector plug specifications are as follows:

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

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

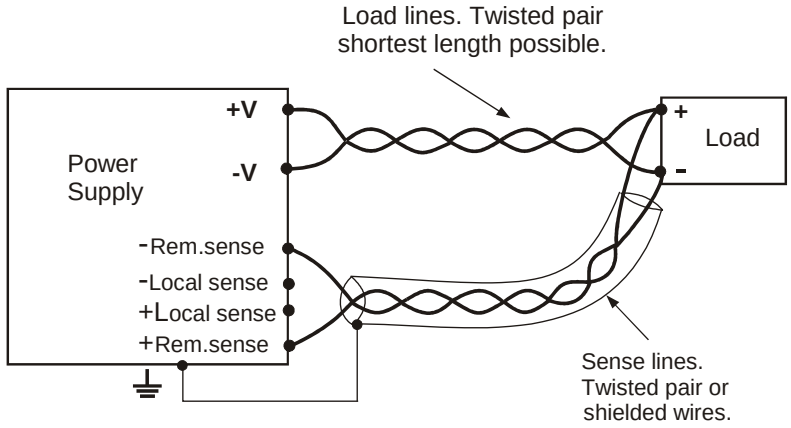
Use remote sensing in applications where load regulation at the load is critical. Remote sensing allows the power supply to compensate for the voltage drop in the load leads. See Appendix A under Remote Sense Compensation for the maximum allowable voltage drop on the load wires.

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.



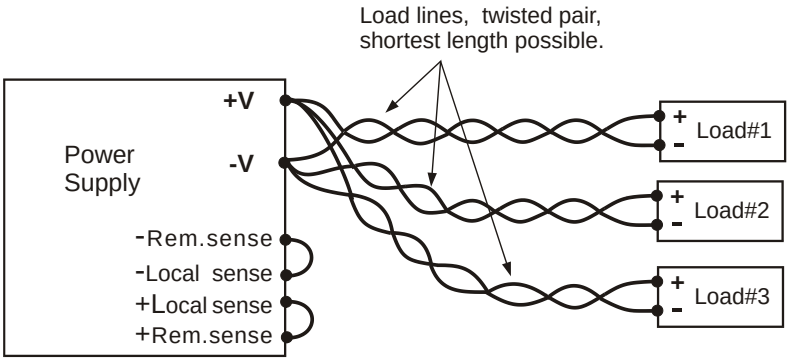
NOTE If the power supply is operated with remote sensing and either the positive or negative load wire is not connected, an internal protection circuit will activate and shut down the power supply. To resume operation, turn the power supply off, connect the open load wire, and turn on the power supply.

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.

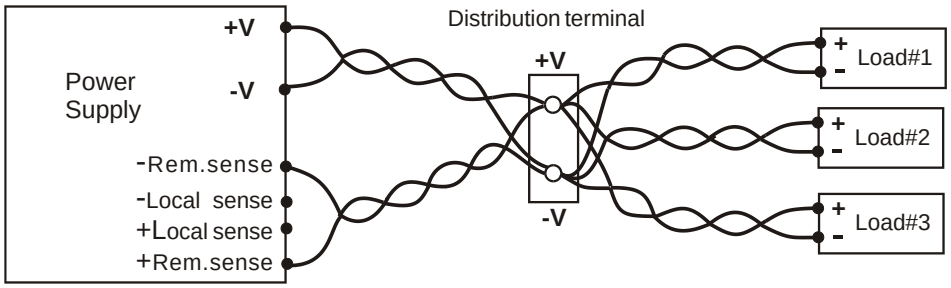
Load Considerations

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 ±60 VDC above or below chassis ground.

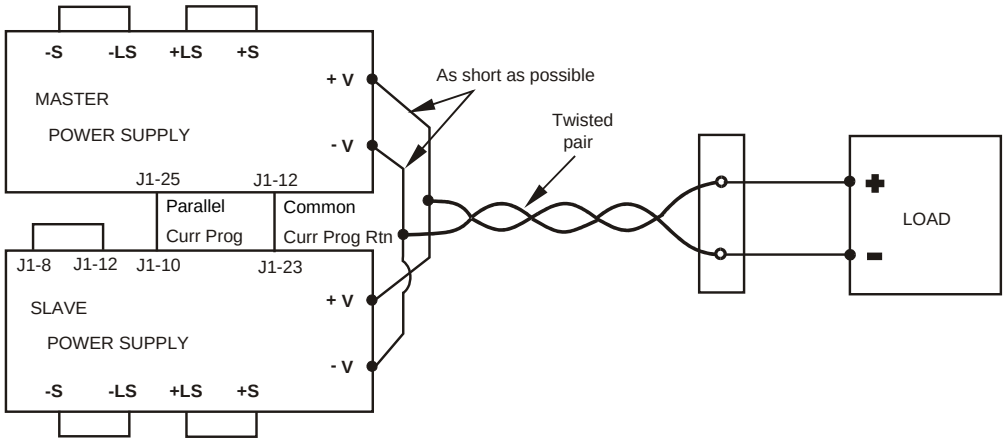
For models greater than 60 VDC rated output, no point on the Positive output shall be more than ±600 VDC above or below chassis ground.

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

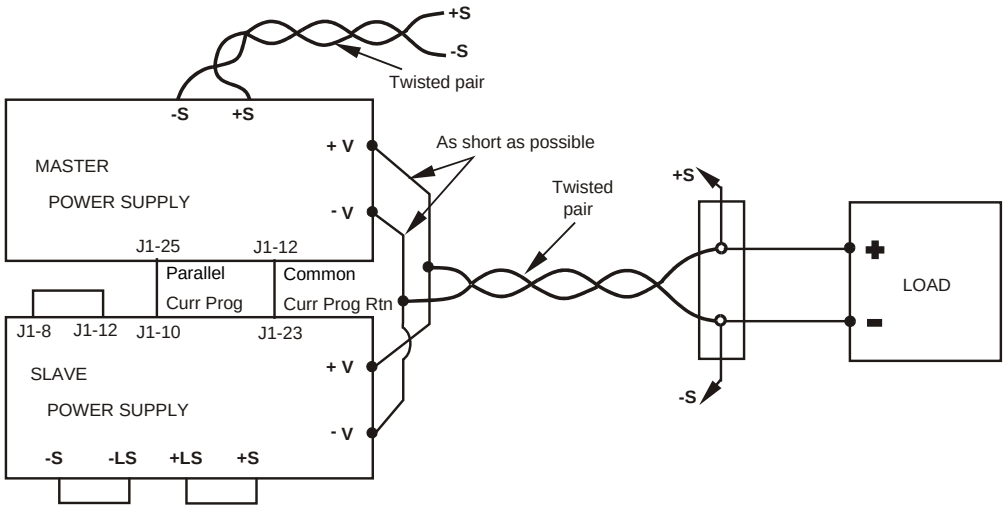
Parallel Connections

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 it's up position. Set the rear panel setup switch SW1 position 3 to the same position as the SW1 position 4 of the master unit. Connect J1 pin 10 (Curr Prog) of the slave unit to J1 pin 25 (Parallel) of the master unit. Connect J1 pin 23 (Curr Prog Rtn) of the slave unit to J1 pin 12 (Common) 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 the entire 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 ±60 VDC above or below chassis ground.

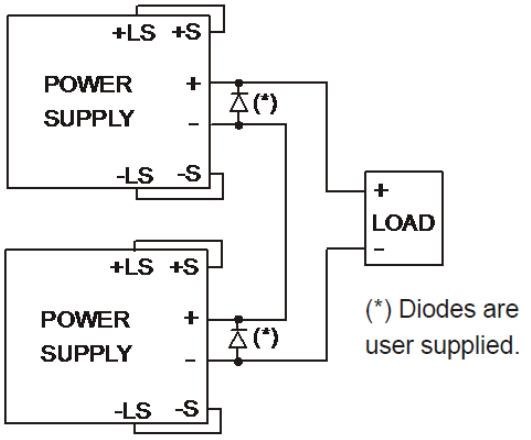
For models greater than 60 VDC rated output, no point on the Positive output shall be more than ±600 VDC above or below chassis ground.

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

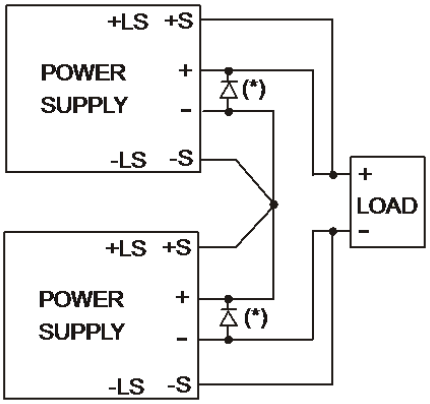
CAUTION Only power supplies that have identical voltage and current ratings can be connected in series.

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.

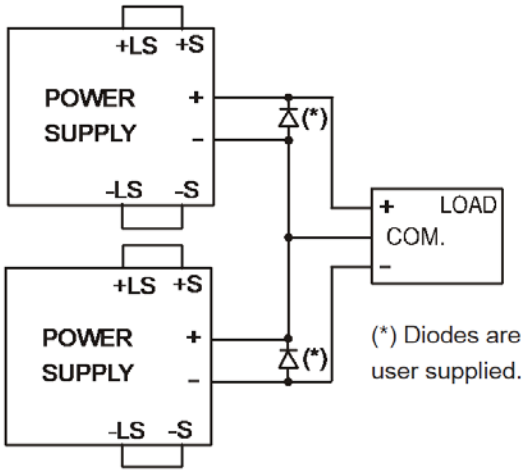


Local Sensing

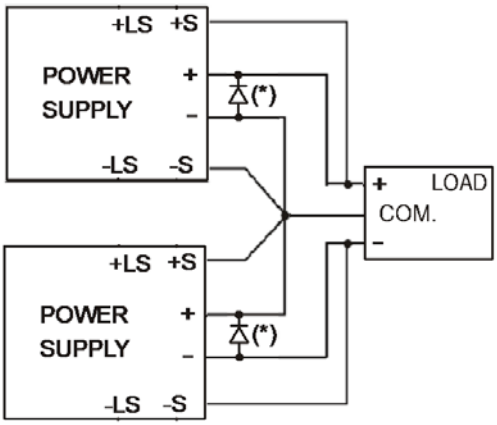


Remote Sensing

As shown in the following figure, two units of the same voltage and current rating can be connected in a split-connection series configuration to provide positive and negative output voltages.



Local Sensing



Remote Sensing

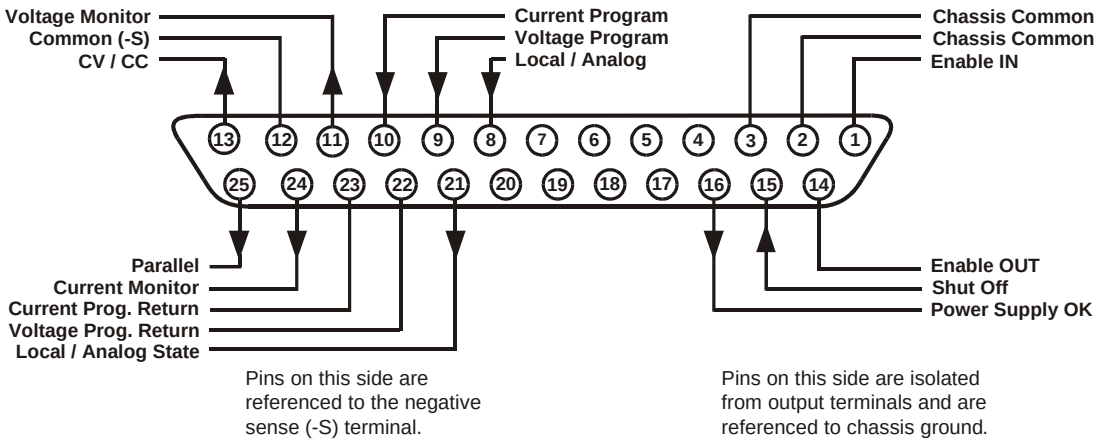
CAUTION This caution applies when using analog voltage programming with series-connected power supplies. The analog programming circuits of these power supplies are referenced to the negative sense (-S) potential. Therefore, the analog voltage circuits used to control each series-connected unit must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

Mating Plug:	AMP part number 745211-2
Wire Size:	AWG 26 to AWG 22
Extraction tool:	AMP part number 91232-1 or equivalent
Manual pistol grip tool:	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

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 46).**

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.

Constant Voltage Check

1 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.

2 Turn the output on by pressing the OUT ON button. The green OUT ON indicator should be illuminated.

3 The green CV indicator should also be illuminated. If the CC indicator is illuminated, rotate the current knob until the CV indicator becomes illuminated.

4 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

1 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.

2 Press the OVP/UVL button once so that the DC AMPS display indicates OUP. The DC VOLTS display shows the OVP level.

3 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.

4 Wait a few seconds until the DC VOLTS display returns to show the output voltage.

5 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.

6 Press the OVP/UVL button again. Rotate the voltage knob and reset the OVP level of the unit to its maximum setting.

UVL Check

1 Press the OVP/UVL button twice so that the DC AMPS display indicates UUL. The DC VOLTS display shows the UVL level.

2 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.

3 Wait a few seconds until the DC VOLTS display returns to show the output voltage.

4 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.

5 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

1 Turn the POWER switch off. Wait a few seconds until the AC indicator on the front panel goes out.

2 Use a heavy wire and short the +V and –V output terminals together.

3 Turn the POWER switch on.

4 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.

5 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

1 Rotate the current knob and set the current limit of the unit to about 10% of its full-scale current rating.

2 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.

3 Press the OCP/488 button again to cancel OCP protection. The DC VOLTS display should indicate OFF because the OCP protection is latched.

4 Press the OUT ON button to reset the OCP protection. The output should return to its previous setting.

5 Turn the POWER switch off.

6 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 30 VDC. 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 10 mA 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.

1. Press the OUT ON button to turn the output on.
2. Turn the AC power off, wait a few seconds, and turn it on.
3. Turn the output off, then on again using the Shut Off pin on the J1 connector. This only applies in Auto-Restart mode.
4. 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.

1. Press the OUT ON button to turn the output on.
2. Turn the AC power off, wait a few seconds, and turn it on.
3. Turn the output off, then on again using the Shut Off pin on the J1 connector. This only applies in Auto-Restart mode.
4. 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 - 15V or Open	On	Voltage/Current
	0 – 0.4V or Short	Off	SO
Up	2 - 15V 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:

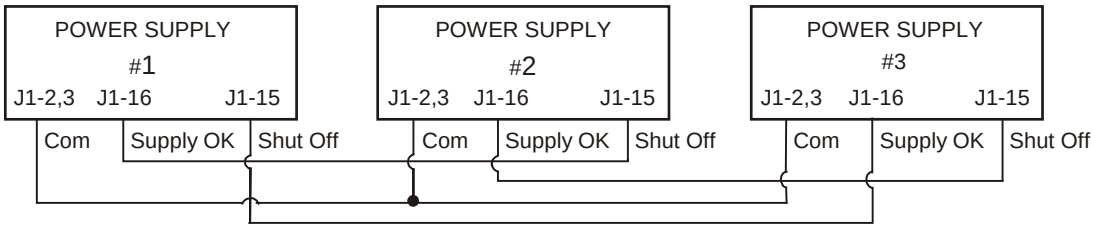
Over-voltage protection	Enable/Disable signal true
Over-current protection	Shut Off signal true
Over-temperature protection	Remote interface failure
AC line failure	Output turned off

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.

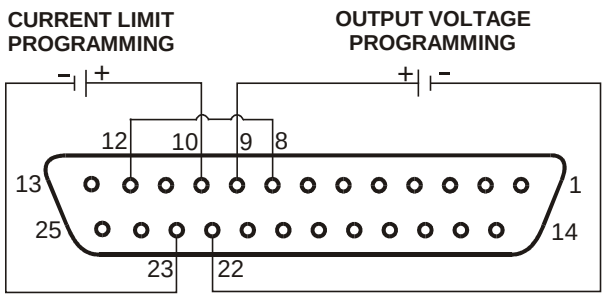
NOTE With analog programming enabled, you cannot program the output voltage or current using the front panel knobs or the remote interface. However, you can read back output voltage or current from the front panel or the remote interface.

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 - 5V or 0 - 10V 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:

1. Make sure that the power supply is turned off.
2. Set SW1 setup switch 1 (for voltage) and 2 (for current) to the Up position.
3. Set SW1 setup switch 3 to select programming voltage range according to the table following these procedure steps.
4. Make sure that SW1 setup switches 7 and 8 are set Down.
5. Connect a short between J1 pin 8 and J1 pin 12 (see following figure).
6. Connect the programming source to the mating plug of J1 as shown in the following figure. Observe the correct polarity for the voltage source.
7. 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 – 5V	0 – 5V
Up	0 – 10V	0 – 10V

Resistance Programming of Output Voltage and Current

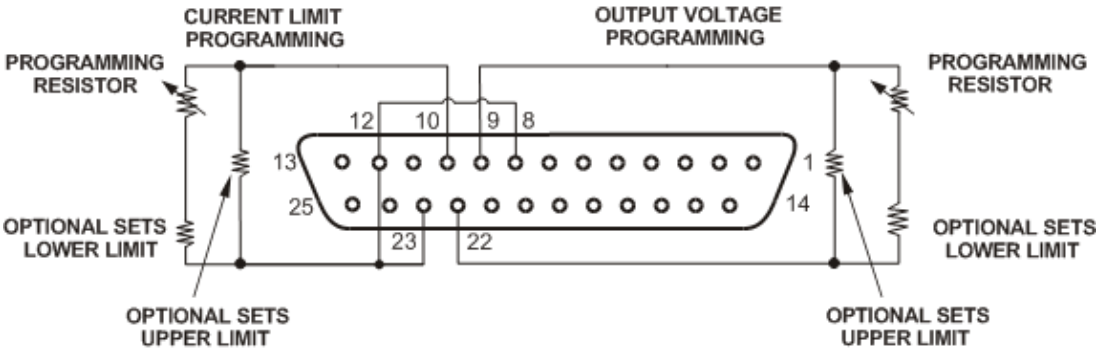
Resistances of 0 - 5 kΩ or 0 - 10 kΩ can be selected to program the output voltage and current limit from zero to full scale. Internal current sources supply a 1 mA current through the external resistors. The voltage drop across the resistors is used as the programming voltage for the power supply. To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

Set the power supply to resistance programming as follows:

1. Make sure that the power supply is turned off.
2. Set SW1 setup switch 1 (for voltage) and 2 (for current) to the UP position.
3. Set SW1 setup switch 3 to select programming resistance range according to the table following these procedure steps.
4. Set SW1 setup switch 7 (for voltage) and 8 (for current) to the Up position to enable resistance programming.
5. Connect a short between J1 pin 8, J1 pin 12, and J1 pin 23 (see figure).
6. 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.
7. 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 – 5V or 0 – 10V 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 500Ω 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 – 5V	J1 pin 11	Voltage Monitor
		J1 pin 24	Current Monitor
Up	0 – 10V	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

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.

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

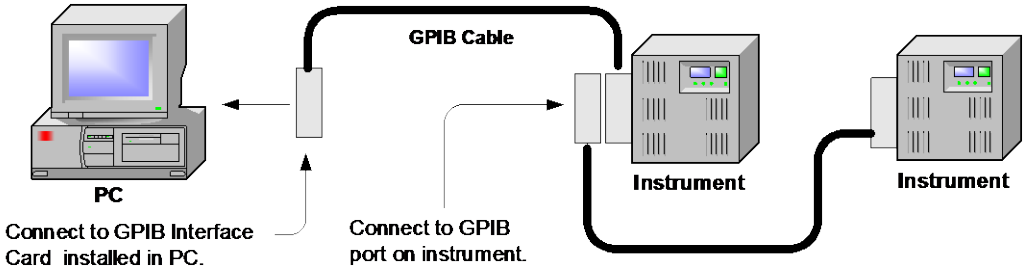
The Keysight N8700 power supplies support remote interface communication using a choice of three interfaces: GPIB, USB, and LAN. All three interfaces are live at power-on.

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.

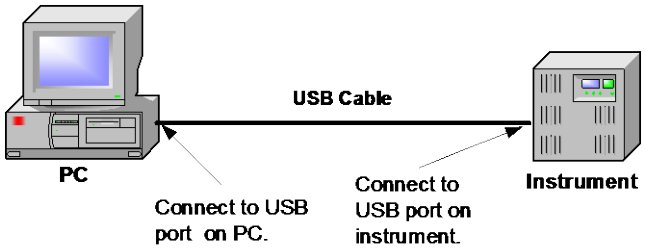


1. If you have not already done so, install the Keysight IO Libraries Suite from the Automation-Ready CD-ROM that is shipped with your product.
2. If you do not have a GPIB interface card installed on your computer, turn off your computer and install the GPIB card.
3. Connect your instrument to the GPIB 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::model-serialnumber::0:INSTR where 2391 is the Keysight code, 2055 is the N8700 code, model is the 6-character model number, and serialnumber 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.

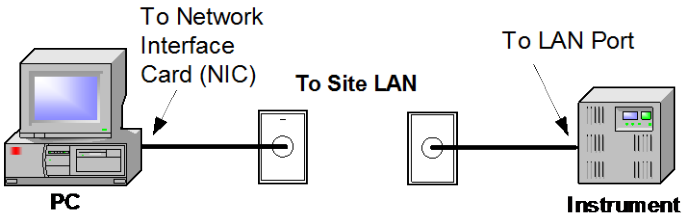
LAN Interface

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 N8700 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. N8741A), 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-N8741A-H1234 is an example of a hostname.

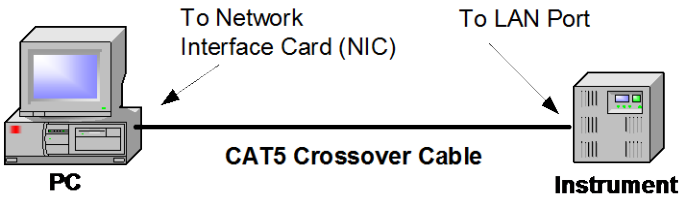
3. Use the Connection Expert utility of the Keysight IO Libraries Suite to add the N8700 power supply and verify a connection. To add the instrument, you can request the Connection Expert to discover the instrument. If the instrument cannot be found, you can add the instrument using the instrument's 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 N8700 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. Your 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 N8700 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.

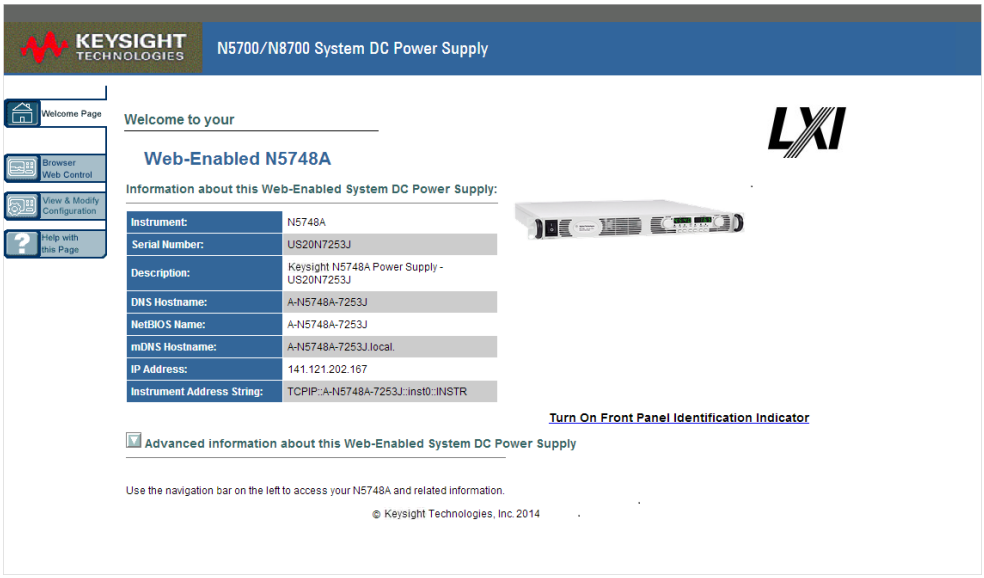
2 Select Connections in the Tools menu, under Internet Options. Then select LAN Settings and make sure that the Bypass proxy server for local addresses box is checked.

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”.



Using Telnet

In an MS-DOS Command Prompt box type: *telnet hostname 5024* where *hostname* is the N8700 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.

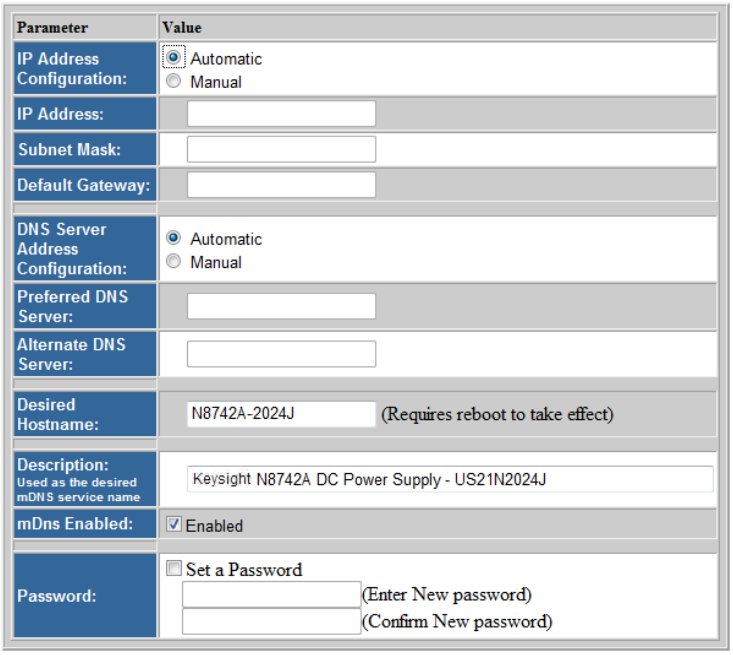
To send a device clear, send the string "DCL" to the control socket. When the power supply has finished performing the device clear it echoes the string "DCL" back to the control socket.

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 dialog lets you modify the LAN parameters:



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.

Subnet Mask	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.
Default Gateway	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.
DNS Server Address Configuration	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 form a DHCOP server. If Manual is selected, the instrument uses the DNS servers below.
Preferred DNS Server	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.
Alternate DNS Server	This is the address of the alternate Domain Name System (DNS) server.
Desired Hostname	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>.
Description	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.
mDNS Enabled	This enables or disables mDNS service announcements. mDNS is affected bvy the Desired Hostname and Description fields.
Password	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-N87xxA-xxxxx
Subnet Mask	255.255.0.0	Description	Keysight N87xxA (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
	Parameter Formats
<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 (milliampere)
Amplitude	V	volt	MV (millivolt)
Time	S	second	MS (millisecond)
Common Multipliers			
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

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]	Calibrates the output current programming
:DATA <NRf>	Enters the calibration value
:DATE <"SPD">	Sets the calibration date
:LEVel P1 | P2	Advances to the next calibration step
:PASSword <NRf>	Sets the numeric calibration password
:STATE <Bool> [,<NRf>]	Enables/disables calibration mode
:VOLTage[:LEVel]	Calibrates the output voltage programming
INITiate	
[:IMMediate][:TRANsient]	Initiates the trigger system
:CONTinuous[:TRANsient]	Enables/disables continuous triggers
MEASure	
[:SCALar]	
:CURRent[:DC]?	Returns the measured output current
:VOLTage[:DC]?	Returns the measured output voltage
OUTPut	
[:STATe] <Bool>	Enables/disables the specified output
:PON	
:STATe RST | AUTO	Programs the Power-On State
:PROTection	
:CLEar	Resets latched protection
[SOURce:]	
CURRent	
[:LEVel]	
[:IMMediate][:AMPLitude] <NRf+>	Sets the output current
:TRIGgered[:AMPLitude] <NRf+>	Sets the triggered output current
:PROTection	
:STATe <Bool>	Enables/disables over-current protection
VOLTage	
[:LEVel]	
[:IMMediate][:AMPLitude] <NRf+>	Sets the output voltage
:TRIGgered[:AMPLitude] <NRf+>	Sets the triggered output voltage
:LIMit	
:LOW <NRf+>	Sets the low-voltage limit
:PROTection	
[:LEVel] <NRf+>	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 transient 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. Values are programmed in amperes. The immediate level is the output current setting. The triggered level is a stored value that transfers to the output when a trigger occurs. The *RST values = Min.

Model (I rating)	400A	330A	220A	165A	110A	85A	55A	42A	33A	22A	11A	5.5A
Minimum current	0	0	0	0	0	0	0	0	0	0	0	0
Maximum current	420	346.5	231	173.25	115.5	89.25	57.75	44.1	34.65	23.1	11.55	5.775
Model (I rating)				250A	170A	125A	85A	65A	50A	34A	17A	8.5A
Minimum current				0	0	0	0	0	0	0	0	0
Maximum current				262.5	178.5	131.25	89.25	68.25	52.5	35.7	17.85	8.925

[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. Values are programmed in volts. The immediate level is the output voltage setting. The triggered level is a stored value that transfers to the output when a trigger occurs. The *RST values = Min.

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)	8V	10V	15V	20V	30V	40V	60V	80V	100V	150V	300V	600V
Minimum voltage	0	0	0	0	0	0	0	0	0	0	0	0
Maximum voltage	8.4	10.5	15.75	21	31.5	42	63	84	105	157.5	315	630

[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 = Min.

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)	8V	10V	15V	20V	30V	40V	60V	80V	100V	150V	300V	600V
Minimum low limit	0	0	0	0	0	0	0	0	0	0	0	0
Maximum low limit	7.6	9.5	14.25	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.

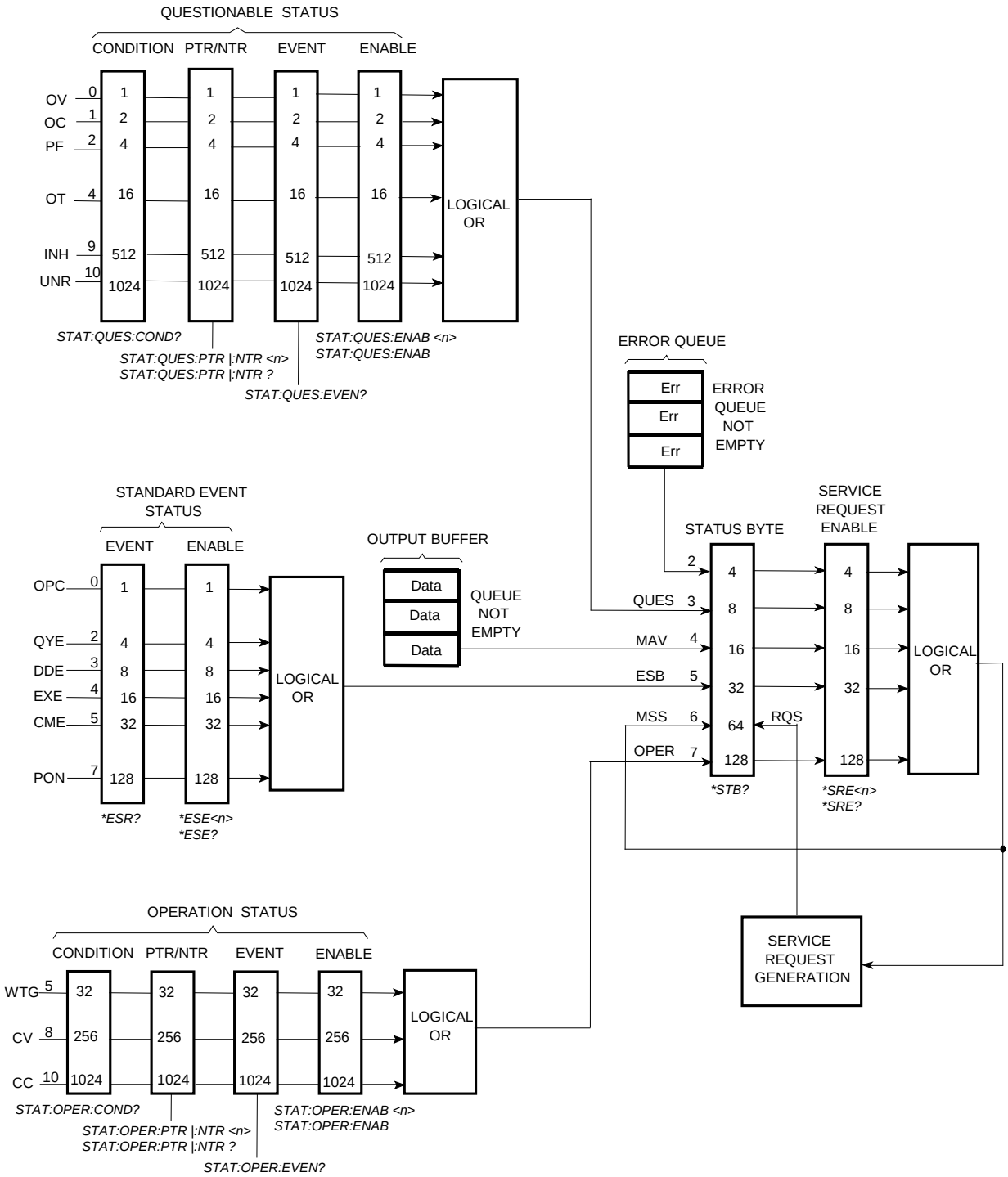
The range of values that can be programmed for this command is coupled with the immediate voltage level setting. The minimum value for the voltage protection level is either the value in the following table, or the immediate voltage setting multiplied by 1.05; whichever is higher. The maximum setting 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)	8V	10V	15V	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	10	12	18	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
CME = Command error
EXE = Execution error
DDE = Device-dependent error
QUE = Query 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 (RQS)	ESB	MAV	QUES	ERR	–

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

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.

KEYSIGHT TECHNOLOGIES

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 neccessary 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::N8741A-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::N8741A-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
```

```
        ' 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

This chapter lists the specifications and supplemental characteristics of the Keysight N8700 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.

KEYSIGHT TECHNOLOGIES

Performance Specifications

Keysight Models N8731A – N8742A and Models N8754A – N8762A

Model 3.3kW 5kW	N8731A	N8732A	N8733A	N8734A N8754A	N8735A N8755A	N8736A N8756A	N8737A N8757A	N8738A N8758A	N8739A N8759A	N8740A N8760A	N8741A N8761A	N8742A N8762A
DC Output Ratings: NOTE 1												
Voltage 3.3kW	8V	10V	15V	20V	30V	40V	60V	80V	100V	150V	300V	600V
Voltage 5kW				20V	30V	40V	60V	80V	100V	150V	300V	600V
Current 3.3kW	400A	330A	220A	165A	110A	85A	55A	42A	33A	22A	11A	5.5A
Current 5kW				250A	170A	125A	85A	65A	50A	34A	17A	8.5A
Power 3.3kW	3.2kW	3.3kW	3.3kW	3.3kW	3.3kW	3.4kW	3.3kW	3.36kW	3.3kW	3.3kW	3.3kW	3.3kW
Power 5kW				5kW	5.1kW	5kW	5.1kW	5.2kW	5kW	5.1kW	5.1kW	5.1kW
Output Ripple and Noise:												
CV p-p NOTE 2 3.3kW	60mV	60mV	60mV	60mV	60mV	60mV	60mV	80mV	100mV	100mV	300mV	500mV
CV p-p NOTE 2 5kW				75mV	75mV	75mV	75mV	100mV	100mV	120mV	300mV	500mV
CV rms NOTE 3 3.3kW	8mV	8mV	8mV	8mV	8mV	8mV	8mV	25mV	25mV	25mV	100mV	120mV
CV rms NOTE 3 5kW				10mV	10mV	10mV	10mV	15mV	15mV	25mV	60mV	120mV
Load Effect: (change from 10% to 90% of full load)												
Voltage 3.3kW	6.2mV	6.5mV	7.3mV	8mV	9.5mV	11mV	14mV	17mV	20mV	27.5mV	50mV	95mV
Voltage 5kW				8mV	9.5mV	11mV	14mV	17mV	20mV	27.5mV	50mV	95mV
Current 3.3kW	85mA	71mA	49mA	38mA	27mA	22mA	16mA	13.4mA	11.6mA	9.4mA	7.2mA	6.1mA
Current 5kW				250mA	170mA	125mA	85mA	65mA	50mA	34mA	17mA	8.5mA
Source Effect: (change from 170-265Vac for 200Vac models, or 342-460Vac for 400Vac models; with constant load)												
Voltage 3.3kW	2.8mV	3mV	3.5mV	4mV	5mV	6mV	8mV	10mV	12mV	17mV	32mV	62mV
Voltage 5kW				2mV	3mV	4mV	6mV	8mV	10mV	15mV	30mV	60mV
Current 3.3kW	42mA	35mA	24mA	18.5mA	13mA	10.5mA	7.5mA	6.2mA	5.3mA	4.2mA	3.1mA	2.6mA
Current 5kW				125mA	85mA	62.5mA	42.5mA	32.5mA	25mA	17mA	8.5mA	4.3mA
Programming Accuracy: NOTE 1												
Voltage 3.3kW 0.05%+	4mV	5mV	7.5mV	10mV	15mV	20mV	30mV	40mV	50mV	75mV	150mV	300mV
Voltage 5kW 0.025%+				15mV	22.5mV	30mV	45mV	60mV	75mV	112.5mV	225mV	450mV
Current 3.3kW 0.1%+	800mA	660mA	440mA	330mA	220mA	170mA	110mA	84mA	66mA	44mA	22mA	11mA
Current 5kW 0.1%+				750mA	510mA	375mA	255mA	195mA	150mA	102mA	51mA	25.5mA
Measurement Accuracy:												
Voltage 3.3kW 0.1%+	8mV	10mV	15mV	20mV	30mV	40mV	60mV	80mV	100mV	150mV	300mV	600mV
Voltage 5kW 0.025%+				25mV	37.5mV	50mV	75mV	100mV	125mV	187.5mV	375mV	750mV
Current 3.3kW 0.1%+	1.2A	990mA	660mA	495mA	330mA	255mA	165mA	126mA	99mA	66mA	33mA	16.5mA
Current 5kW 0.1%+				750mA	510mA	375mA	255mA	195mA	150mA	102mA	51mA	25.5mA
Load Transient Recovery Time: (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 3.3kW	≤ 1 ms	≤ 1 ms	≤ 1 ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 2ms	≤ 2ms	≤ 2ms
Time 5kW				≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 1ms	≤ 2ms	≤ 2ms	≤ 2ms
Output set point	From 10% to 100% of rated output											

NOTE 1 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.

NOTE 2 20MHz

NOTE 3 From 5Hz - 1MHz

Supplemental Characteristics

Keysight Models N8731A – N8742A and Models N8754A – N8762A

Model 3.3kW 5kW	N8731A	N8732A	N8733A	N8734A N8754A	N8735A N8755A	N8736A N8756A	N8737A N8757A	N8738A N8758A	N8739A N8759A	N8740A N8760A	N8741A N8761A	N8742A N8762A
Output Response Time: (to settle to within ±1.0% of the rated output, with a resistive load)												
Up, full load 3.3kW	0.08s	0.08s	0.08s	0.08s	0.08s	0.08s	0.15s	0.15s	0.15s	0.15s	0.15s	0.25s
Up, full load 5kW				0.03s	0.03s	0.03s	0.05s	0.05s	0.05s	0.05s	0.05s	0.1s
Down, full load 3kW	0.02s	0.1s	0.1s	0.1s	0.16s	0.16s	0.16s	0.3s	0.3s	0.3s	0.3s	0.5s
Down, full load 5kW				0.05s	0.08s	0.08s	0.08s	0.1s	0.1s	0.1s	0.1s	0.2s
Down, no load .3kW	0.5s	0.6s	0.7s	0.8s	0.9s	1.0s	1.1s	1.2s	1.5s	2.0s	3.5s	4.0s
Down, no load 5kW				0.7s	0.8s	0.9s	1.0s	1.2s	1.5s	2.0s	2.5s	3.0s
Command Response Time: (add this to the output response time to obtain the total programming time)												
100 ms												
Remote Sense Compensation: (the load lead drop reduces the maximum available voltage at the load)												
Volts/load lead 3.3kW	2V	2V	2V	2V	5V	5V	5V	5V	5V	5V	5V	5V
Volts/load lead 5kW				2V	5V	5V	5V	5V	5V	5V	5V	5V
Over-voltage Protection:												
Range 3.3kW	0.5-10	0.5-12	1-18	1-24V	2-36V	2-44V	5-66V	5-88V	5-110V	5-165V	5-330V	5-660V
Range 5kW				1-24V	2-36V	2-44V	5-66V	5-88V	5-110V	5-165V	5-330V	5-660V
Output Ripple and Noise: (for 8V-15V models, from 2V to 100% of rated output; for all other models, from 10% to 100% of rated output;)												
CC rms 3.3kW	1.3A	1.2A	880mA	660mA	300mA	200mA	100mA	80mA	70mA	60mA	20mA	10mA
CC rms 5kW				1.0A	460mA	300mA	150mA	120mA	100mA	90mA	30mA	15mA
Programming Resolution: **Measurement Resolution:**												
Voltage 3.3kW	0.96mV	1.2mV	1.8mV	2.4mV	3.6mV	4.8mV	7.2mV	9.6mV	12mV	18mV	36mV	72mV
Voltage 5kW				2.4mV	3.6mV	4.8mV	7.2mV	9.6mV	12mV	18mV	36mV	72mV
Current 3.3kW	48mA	39.6mA	26.4mA	19.8mA	13.2mA	10.2mA	6.6mA	5.0mA	4.0mA	2.6mA	1.3mA	0.66mA
Current 5kW				30mA	20.4mA	15mA	10.2mA	7.8mA	6.0mA	4.1mA	2.0mA	1.0mA
Front Panel Display Accuracy: (4 digits; +% of rated output voltage; ±1 count)												
Voltage 3.3kW	40mV	50mV	75mV	100mV	150mV	200mV	300mV	400mV	500mV	750mV	1.5 V	3.0 V
Voltage 5kW				100mV	150mV	200mV	300mV	400mV	500mV	750mV	1.5 V	3.0 V
Current 3.3kW	2.0A	1.65A	1.10A	825mA	550mA	425mA	275mA	210mA	165mA	110mA	55mA	27.5mA
Current 5kW				1.25A	850mA	625mA	425mA	325mA	250mA	170mA	85mA	42.5mA
Temperature Stability: (over 8 hours, after a 30 minute warm-up, with constant line, load, and temperature)												
Voltage 3.3kW	4mV	5mV	7.5mV	10mV	15mV	20mV	30mV	40mV	50mV	75mV	150mV	300mV
Voltage 5kW				10mV	15mV	20mV	30mV	40mV	50mV	75mV	150mV	300mV
Current 3.3kW	200mA	165mA	110mA	82.5mA	55mA	42.5mA	27.5mA	21mA	16.5mA	11mA	5.5mA	2.8mA
Current 5kW				125mA	85mA	62.5mA	42.5mA	32.5mV	25mV	17mA	8.5mA	4.3mA
Temperature Coefficient: (after a 30 minute warm-up)												
Voltage 3.3kW units	100 PPM/°C from rated output voltage											
Voltage 5kW units	100 PPM/°C from rated output voltage											
Current 3.3kW units	200 PPM/°C from rated output current											
Current 5kW units	100 PPM/°C from rated output current											

Supplemental Characteristics (continued)

Model	3.3kW 5kW	N8731A	N8732A	N8733A	N8734A N8754A	N8735A N8755A	N8736A N8756A	N8737A N8757A	N8738A N8758A	N8739A N8759A	N8740A N8760A	N8741A N8761A	N8742A N8762A

Analog Programming and Monitoring:

Vout voltage	0 - 100%, 0-5V or 0-10V, user selectable, Accuracy & linearity = ± 0.5% of rated Vout
Iout voltage	0 - 100%, 0-5V or 0-10V, user selectable, Accuracy & linearity = ± 1% of rated Iout
Vout resistance	0 - 100%, 0-5kΩ or 0-10kΩ, user selectable, Accuracy & linearity = ± 1% of rated Vout
Iout resistance	0 - 100%, 0-5kΩ or 0-10kΩ, user selectable, Accuracy & linearity = ± 1.5% of rated Iout
Iout monitor	0-5V or 0-10V, user selectable, Accuracy = ± 1%
Vout monitor	0-5V or 0-10V, user selectable, Accuracy = ± 1%
On/Off control	Electrical voltage; 0-0.6V or 2-15V or dry contact, user selectable logic
PS OK signal	TTL high (4-5V) = OK; 0V = FAIL; 500Ω series resistance
CV/CC signal 3.3kW	CV = TTL high (4-5V) source current 10 mA; CC = TTL low (0-0.6V) sink current 10 mA
CV/CC signal 5kW	Open collector; CV mode: OFF, CC mode: ON, Maximum voltage = 30V; Maximum sink current = 10 mA
Enable/Disable	Dry contact. Open=Off, Short=On. Maximum voltage at terminal = 6V.

Series and Parallel Capability:

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 (see Output Terminal Isolation)

Savable states:

In volatile memory	16 (in memory locations 0-15)

Interface Capabilities:

GPIB	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 M.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

Environmental Conditions:

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 85°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 **and** derate the maximum ambient temperature by 1°C/100m.
Built-in Web server	Requires Internet Explorer 5+ or Netscape 6.2+

Output Terminal Isolation:

8V to 60V units	No output terminal may be more than ± 60 VDC from any other terminal or chassis ground.
80V to 600V units	No Positive output terminal may be more than ± 600 VDC from any other terminal or chassis ground. No Negative output terminal may be more than ± 400 VDC from any other terminal or chassis ground.

Acoustic Noise Declaration:

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).

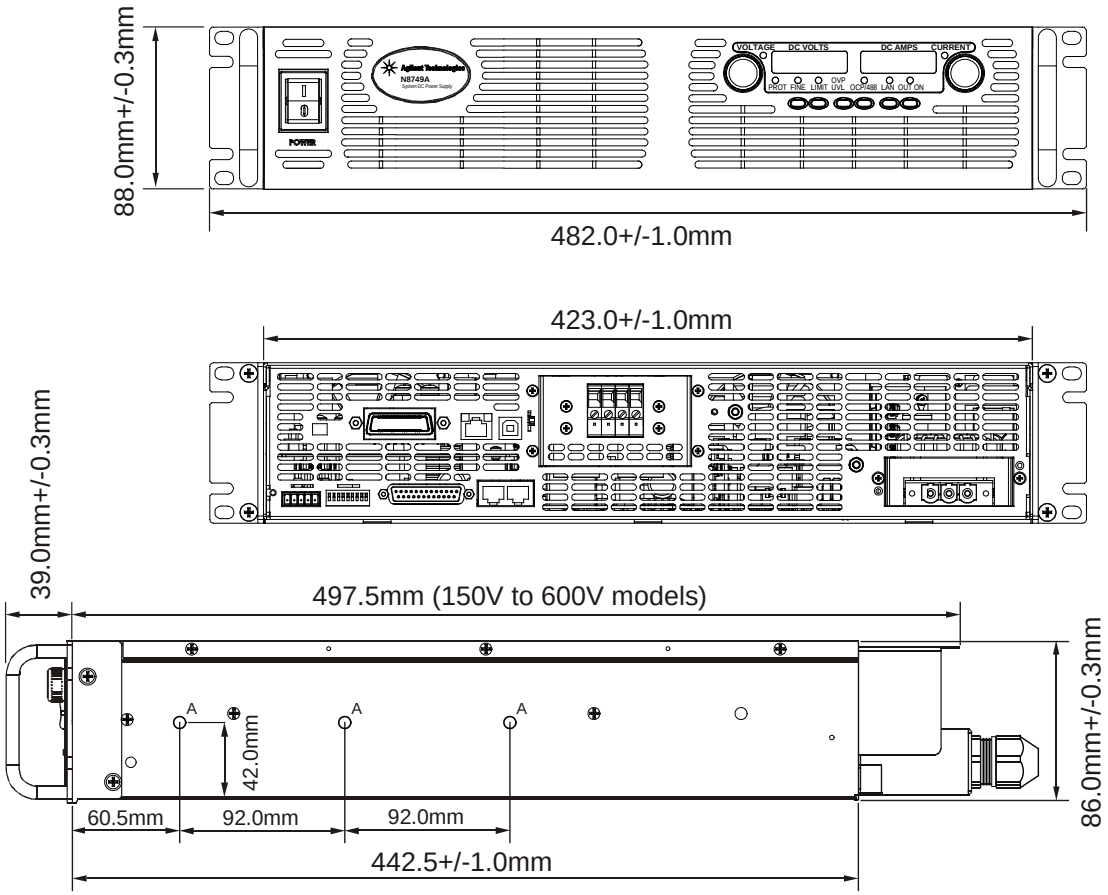
Regulatory Compliance:

EMC	Complies with European EMC Directive for test and measurement products. ● IEC/EN 61326-1 ● CISPR 11, Group 1, class A ● AS/NZS CISPR 11 ● ICES/NMB-001 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.

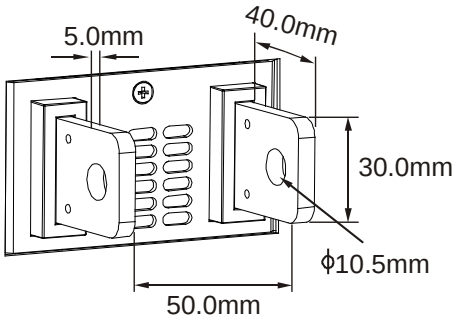
Supplemental Characteristics (continued)

Model	3.3kW 5kW	N8731A	N8732A	N8733A	N8734A N8754A	N8735A N8755A	N8736A N8756A	N8737A N8757A	N8738A N8758A	N8739A N8759A	N8740A N8760A	N8741A N8761A	N8742A N8762A
AC Input:													
Nominal Input													
3.3kW single-phase	ALL Models: 190 – 240 Vac; 50/60Hz												
3.3kW & 5kW 3-phase	200 Vac Models: 190 – 240 Vac; 50/60Hz												
3.3kW & 5kW 3-phase	400 Vac Models: 380 – 415 Vac; 50/60Hz												
Input Current													
3.3kW single-phase	ALL Models: 23 – 24A Max @ 100% load												
3.3kW 3-phase	200 Vac Models: 13.6 – 14.5A Max @ 100% load												
3.3kW 3-phase	400 Vac Models: 6.8 – 7.2A Max @ 100% load												
5kW 3-phase	200 Vac Models: 21 – 22A Max @ 100% load												
5kW 3-phase	400 Vac Models: 10.5 – 12A Max @ 100% load												
Input Range													
Single-phase models	170 – 265 Vac; 47 – 63 Hz												
3-phase, 200V models	170 – 265 Vac; 47 – 63 Hz												
3-phase, 400V models	342 – 460 Vac; 47 – 63 Hz												
Input VA													
3.3kW units	4000 VA												
5kW units	5800 VA												
Power Factor													
3.3kW units	Single-phase models: 0.99 at nominal input and rated output power												
3.3kW units	3-phase models: 0.95 at nominal input and rated output power												
5kW units	3-phase models: 0.94 at nominal input and rated output power												
Efficiency													
3.3kW units	82% – 88%												
5kW units	83% – 88%												
Inrush Current													
Single-phase models	< 50A												
3-phase, 200V models	< 50A												
3-phase, 400V models	< 20A												

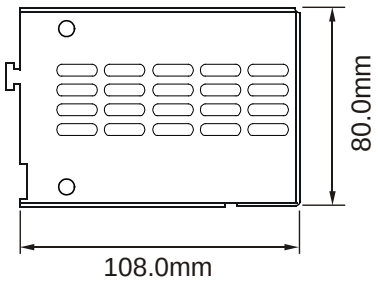
Outline Diagram



Bus-Bar Detail
8V to 100V Models



Output Cover Detail
8V to 100V Models



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

Appendix B
Verification and Calibration

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 N8700 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.

The recommended calibration interval for Keysight N8700 power supplies is one year.

Verification

Verification procedures are of two types:

Performance These procedures verify that the power supply is operating normaly and meets all of the published specifications listed in Appendix A. These tests also verify the power supply is properly calibrated.

Calibration These procedures calibrate the power supply and set operation within the published specifications. Calibration is recommended annually.

If the power supply fails any of the verification tests, perform the calibration procedures. 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. Test records for all models are at the end of this verification 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	15A (0.1Ω) 0.04%, TC=4ppm/°C 100A (0.01Ω) 0.04%, TC=4ppm/°C 300A (0.001Ω) 0.04%, TC=4ppm/°C 500A (0.0005Ω) 0.04%, TC=4ppm/°C	Guildline 9230/15 Guildline 9230/100 Guildline 9230/300 Guildline 9230/500
Load Resistor (nominal values)	For 3.3 kW models: 0.02Ω, 0.03Ω, 0.068Ω, 0.12Ω, 0.27Ω, 0.47Ω, 1.1Ω, 1.9Ω, 3.0Ω, 6.8Ω, 27.3Ω, 109Ω - all resistors 3.5 kW minimum. For 5 kW models: 0.08Ω, 0.176Ω, 0.32Ω, 0.705Ω, 1.23Ω, 2.0Ω, 4.40Ω, 17.6Ω, 70.6Ω - all resistors 5.5 kW minimum.	
Electronic Load	150V, 400A, 3.3kW minimum for Models N8731-N8740A 150V, 250A, 5kW minimum for Models N8754-N8760A 600 V, 300 A, 5kW minimum - optional for models N8741A, N8742A, N8761A, N8762A	Keysight N3300A mainframes (up to 4); Keysight N3305A modules (up to 11); Keysight N3306A modules (up to 9) Amrel Model PLA-5K-600-300
GPIB Controller	Full GPIB capabilities - for calibrating 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: 100V	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 eqivalent
Terminations	1 – 50Ω BNC termination	
Variable-voltage xfmr or AC source	Power: 3 Phase 24KVA; Range: 180-235V 47 - 63Hz; 360- 440V 47 - 63Hz	Superior Powerstat 1156DT-3Y, 0-280V, 50A, 24.2 KVA or equivalent

Test Records

Test records for each power supply model are provided after the test procedure sections.

3.3 kW test records are provided followed by the 5 kW test records.

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.

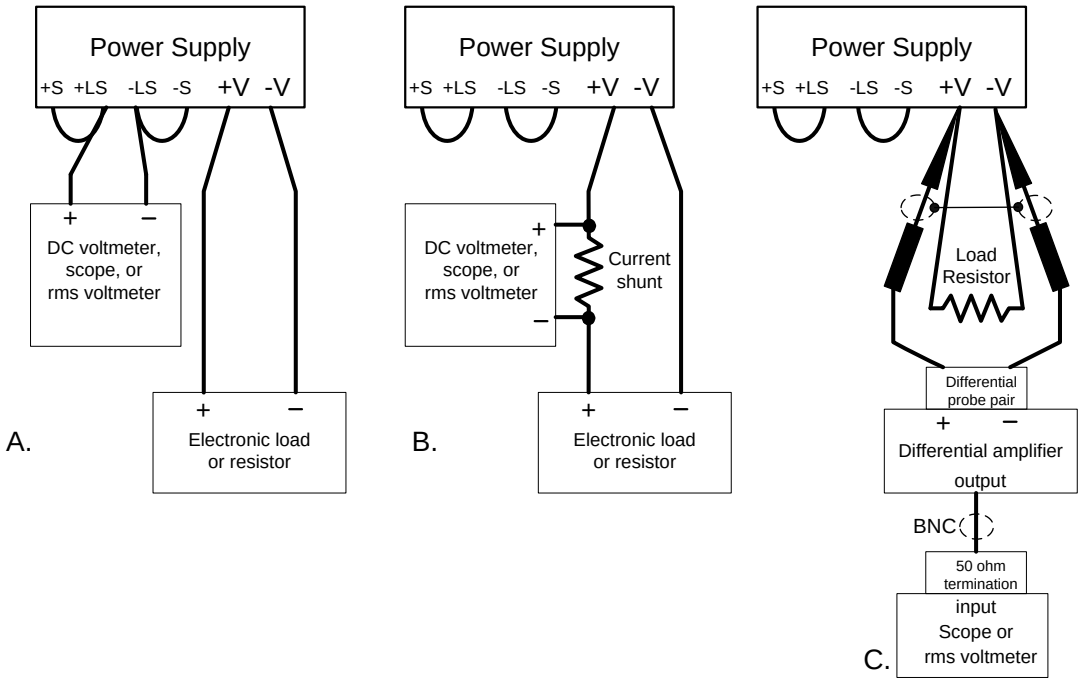
Fixed load resistors may be used in place of a variable load, with minor changes to the test procedures. Also, if computer controlled test setups are used, the relatively slow (compared to computers and system voltmeters) settling times and slew rates of the power supply may have to be taken into account. "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 46).

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 (Imax) 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 for the model being tested under Voltage Programming and Readback, Minimum Voltage Vout.
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 for the appropriate model under Voltage Programming and Readback, High Voltage Vout.

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 (Imax) 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 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 (Imax) 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 (170 VAC for 200 nominal line; 342 VAC for 400 nominal line).
6. Record the output voltage reading from the DVM.
7. Adjust the transformer to the high-line voltage (265 VAC for 200 nominal line; 460 VAC for 400 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 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 3.3kW outputs; use the indicated load resistor for 5kW 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 Ω 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 (Imax) 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 Ω termination. Divide the reading of the rms voltmeter by 10. The result should not exceed the rms limits in the test record 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.

6 Turn off the power supply and connect the output as in figure A with the oscilloscope across the +S and -S terminals.

7 Turn on the power supply and program the output current to its maximum programmable value (Imax) 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.

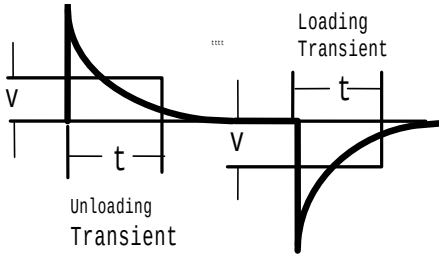
8 Set the electronic load to operate in constant current mode. Program its load current to 10% of the power supply's full-scale current value.

9 Set the electronic load's transient generator frequency to 100 Hz and its duty cycle to 50%.

10 Program the load's transient current level to 90% of the power supply's full-scale current value. Turn the transient generator on.

11 Adjust the oscilloscope for a waveform similar to that shown in the following figure.

12 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 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 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 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 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 (170 VAC for 200 nominal line; 342 VAC for 400 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 (265 VAC for 200 nominal line; 460 VAC for 400 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 for the appropriate model under CC Source Effect.

10 Return the voltage and current settings to zero.

Test Record – Keysight N8731A [8V, 400A, 3.3kW]

Keysight N8731A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	16 mV	_____	24 mV
Measurement Readback	Vout – 8 mV	_____	Vout + 8 mV
High Voltage Vout	7.992 V	_____	8.008 V
Measurement Readback	Vout – 16 mV	_____	Vout + 16 mV
CV Load Effect	– 6.2 mV	_____	+ 6.2 mV
CV Source Effect	– 2.8 mV	_____	+ 2.8 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	60 mV
rms	N/A	_____	8 mV
Transient Response			
Voltage @ 1 ms	– 40 mV	_____	+ 40 mV
Current Programming & Readback			
Minimum Current Iout	1.6 A	_____	3.2 A
Measurement Readback	Iout – 1.2 A	_____	Iout + 1.2 A
High Current Iout	398.8 A	_____	401.2 A
Measurement Readback	Iout – 1.6 A	_____	Iout + 1.6 A
CC Load Effect	– 85 mA	_____	+ 85 mA
CC Source Effect	– 42 mA	_____	+ 42 mA

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

Test Description	N8731A Settings
Voltage Programming & Readback, Min Voltage	20 mV, 2.4A
Voltage Programming & Readback, High Voltage	8V, 2.4A
CV Load Effect, Source Effect, Ripple and Noise	8V, 400A
Transient Response	8V, from 40A to 360A
Current Programming & Readback, Min Current	2.4A, 8V
Current Programming & Readback, High Current	400A, 8V
CC Load Effect, Source Effect	400A, 8V

N8731A Load Requirements	
Current shunt	0.0005Ω 500 A
Keysight N3300 Electronic load modules	6 – N3306A
Fixed Resistor for CV Ripple and Noise	0.02Ω 3.5 kW

Test Record – Keysight N8732A [10V, 330A, 3.3kW]

Keysight N8732A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	20 mV	_____	30 mV
Measurement Readback	Vout – 10 mV	_____	Vout + 10 mV
High Voltage Vout	9.990 V	_____	10.010 V
Measurement Readback	Vout – 20 mV	_____	Vout + 20 mV
CV Load Effect	– 6.5 mV	_____	+ 6.5 mV
CV Source Effect	– 3 mV	_____	+ 3 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	60 mV
rms	N/A	_____	8 mV
Transient Response			
Voltage @ 1 ms	– 50 mV	_____	+ 50 mV
Current Programming & Readback			
Minimum Current Iout	1.3 A	_____	2.6 A
Measurement Readback	Iout – 990 mA	_____	Iout + 990 mA
High Current Iout	329.01 A	_____	330.99 A
Measurement Readback	Iout – 1.32 A	_____	Iout + 1.32 A
CC Load Effect	– 71 mA	_____	+ 71 mA
CC Source Effect	– 35 mA	_____	+ 35 mA

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

Test Description	N8732A Settings
Voltage Programming & Readback, Min Voltage	25 mV, 2A
Voltage Programming & Readback, High Voltage	10V, 2A
CV Load Effect, Source Effect, Ripple and Noise	10V, 330A
Transient Response	10V, from 33A to 297A
Current Programming & Readback, Min Current	2A, 10V
Current Programming & Readback, High Current	330A, 10V
CC Load Effect, Source Effect	330A, 10V

N8732A Load Requirements	
Current shunt	0.0005Ω 500 A
Keysight N3300 Electronic load modules	6 – N3306A
Fixed Resistor for CV Ripple and Noise	0.03Ω 3.5 kW

Test Record – Keysight N8733A [15V, 220A, 3.3kW]

Keysight N8733A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	30 mV	_____	45 mV
Measurement Readback	Vout – 15 mV	_____	Vout + 15 mV
High Voltage Vout	14.985 V	_____	15.015 V
Measurement Readback	Vout – 30 mV	_____	Vout + 30 mV
CV Load Effect	– 7.3 mV	_____	+ 7.3 mV
CV Source Effect	– 3.5 mV	_____	+ 3.5 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	60 mV
rms	N/A	_____	8 mV
Transient Response			
Voltage @ 1 ms	– 75 mV	_____	+ 75 mV
Current Programming & Readback			
Minimum Current Iout	0.88 A	_____	1.76 A
Measurement Readback	Iout – 660 mA	_____	Iout + 660 mA
High Current Iout	219.34 A	_____	220.66 A
Measurement Readback	Iout – 880 mA	_____	Iout + 880 mA
CC Load Effect	– 49 mA	_____	+ 49 mA
CC Source Effect	– 24 mA	_____	+ 24 mA

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

Test Description	N8733A Settings
Voltage Programming & Readback, Min Voltage	37.5 mV, 1.32 A
Voltage Programming & Readback, High Voltage	15V, 1.32 A
CV Load Effect, Source Effect, Ripple and Noise	15V, 220 A
Transient Response	15V, from 22A to 198A
Current Programming & Readback, Min Current	1.32 A, 15V
Current Programming & Readback, High Current	220A, 15V
CC Load Effect, Source Effect	220A, 15V

N8733A Load Requirements	
Current shunt	0.001Ω 300A
Keysight N3300 Electronic load modules	6 – N3306A
Fixed Resistor for CV Ripple and Noise	0.068Ω 3.5 kW

Test Record – Keysight N8734A [20V, 165A, 3.3kW]

Keysight N8734A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	40 mV	_____	60 mV
Measurement Readback	Vout – 20 mV	_____	Vout + 20 mV
High Voltage Vout	19.98 V	_____	20.02 V
Measurement Readback	Vout – 40 mV	_____	Vout + 40 mV
CV Load Effect	– 8 mV	_____	+ 8 mV
CV Source Effect	– 4 mV	_____	+ 4 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	60 mV
rms	N/A	_____	8 mV
Transient Response			
Voltage @ 1 ms	– 100 mV	_____	+ 100 mV
Current Programming & Readback			
Minimum Current Iout	660 mA	_____	1.32 A
Measurement Readback	Iout – 495 mA	_____	Iout + 495 mA
High Current Iout	164.505 A	_____	165.495 A
Measurement Readback	Iout – 660 mA	_____	Iout + 660 mA
CC Load Effect	– 38 mA	_____	+ 38 mA
CC Source Effect	– 18.5 mA	_____	+ 18.5 mA

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

Test Description	N8734A Settings
Voltage Programming & Readback, Min Voltage	50 mV, 990 mA
Voltage Programming & Readback, High Voltage	20V, 990 mA
CV Load Effect, Source Effect, Ripple and Noise	20V, 165A
Transient Response	20V, from 16.5A to 148.5A
Current Programming & Readback, Min Current	990 mA, 20V
Current Programming & Readback, High Current	165A, 20V
CC Load Effect, Source Effect	165A, 20V

N8734A Load Requirements	
Current shunt	0.001Ω 300 A
Keysight N3300 Electronic load modules	6 – N3306A
Fixed Resistor for CV Ripple and Noise	0.21Ω 3.5 kW

Test Record – Keysight N8735A [30V, 110A, 3.3kW]

Keysight N8735A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	60 mV	_____	90 mV
Measurement Readback	Vout – 30 mV	_____	Vout + 30 mV
High Voltage Vout	29.97 V	_____	30.03 V
Measurement Readback	Vout – 60 mV	_____	Vout + 60 mV
CV Load Effect	– 9.5 mV	_____	+ 9.5 mV
CV Source Effect	– 5 mV	_____	+ 5 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	60 mV
rms	N/A	_____	8 mV
Transient Response			
Voltage @ 1 ms	– 150 mV	_____	+ 150 mV
Current Programming & Readback			
Minimum Current Iout	440 mA	_____	880 mA
Measurement Readback	Iout –330 mA	_____	Iout + 330 mA
High Current Iout	109.67 A	_____	110.33 A
Measurement Readback	Iout – 440 mA	_____	Iout + 440 mA
CC Load Effect	– 27 mA	_____	+ 27 mA
CC Source Effect	– 13 mA	_____	+ 13 mA

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

Test Description	N8735A Settings
Voltage Programming & Readback, Min Voltage	75 mV, 660 mA
Voltage Programming & Readback, High Voltage	30V, 660 mA
CV Load Effect, Source Effect, Ripple and Noise	30V, 110 A
Transient Response	30V, from 11A to 99A
Current Programming & Readback, Min Current	660 mA, 30V
Current Programming & Readback, High Current	110A, 30V
CC Load Effect, Source Effect	110A, 30V

N8735A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	6 – N3306A
Fixed Resistor for CV Ripple and Noise	0.27Ω 3.5 kW

Test Record – Keysight N8736A [40V, 85A, 3.3kW]

Keysight N8736A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	80 mV	_____	120 mV
Measurement Readback	Vout – 40 mV	_____	Vout + 40 mV
High Voltage Vout	39.96 V	_____	40.04 V
Measurement Readback	Vout – 80 mV	_____	Vout + 80 mV
CV Load Effect	– 11 mV	_____	+ 11 mV
CV Source Effect	– 6 mV	_____	+ 6 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	60 mV
rms	N/A	_____	8 mV
Transient Response			
Voltage @ 1 ms	– 200 mV	_____	+ 200 mV
Current Programming & Readback			
Minimum Current Iout	340 mA	_____	680 mA
Measurement Readback	Iout – 255 mA	_____	Iout + 255 mA
High Current Iout	84.745 A	_____	85.255 A
Measurement Readback	Iout – 340 mA	_____	Iout + 340 mA
CC Load Effect	– 22 mA	_____	+ 22 mA
CC Source Effect	– 10.5 mA	_____	+ 10.5 mA

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

Test Description	N8736A Settings
Voltage Programming & Readback, Min Voltage	100 mV, 510 mA
Voltage Programming & Readback, High Voltage	40V, 510 mA
CV Load Effect, Source Effect, Ripple and Noise	40V, 85A
Transient Response	40V, from 8.5A to 76.5A
Current Programming & Readback, Min Current	510 mA, 40V
Current Programming & Readback, High Current	85A, 40V
CC Load Effect, Source Effect	85A, 40V

N8736A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	6 – N3306A
Fixed Resistor for CV Ripple and Noise	0.47Ω 3.5 kW

Test Record – Keysight N8737A [60V, 55A, 3.3kW]

Keysight N8737A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	120 mV	_____	180 mV
Measurement Readback	Vout – 60 mV	_____	Vout + 60 mV
High Voltage Vout	59.94 V	_____	60.06 V
Measurement Readback	Vout – 120 mV	_____	Vout + 120 mV
CV Load Effect	– 14 mV	_____	+ 14 mV
CV Source Effect	– 8 mV	_____	+ 8 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	60 mV
rms	N/A	_____	8 mV
Transient Response			
Voltage @ 1 ms	– 300 mV	_____	+ 300 mV
Current Programming & Readback			
Minimum Current Iout	220 mA	_____	+ 440 mA
Measurement Readback	Iout – 165 mA	_____	Iout + 165 mA
High Current Iout	54.835 A	_____	55.165 A
Measurement Readback	Iout – 220 mA	_____	Iout + 220 mA
CC Load Effect	– 16 mA	_____	+ 16 mA
CC Source Effect	– 7.5 mA	_____	+ 7.5 mA

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

Test Description	N8737A Settings
Voltage Programming & Readback, Min Voltage	150 mV, 330 mA
Voltage Programming & Readback, High Voltage	60V, 330 mA
CV Load Effect, Source Effect, Ripple and Noise	60V, 55A
Transient Response	60V, from 5.5A to 49.5A
Current Programming & Readback, Min Current	330 mA, 60V
Current Programming & Readback, High Current	55A, 60V
CC Load Effect, Source Effect	55A, 60V

N8737A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	6 – N3306A
Fixed Resistor for CV Ripple and Noise	1.1Ω 3.5 kW

Test Record – Keysight N8738A [80V, 42A, 3.3kW]

Keysight N8738A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	160 mV	_____	240 mV
Measurement Readback	Vout – 80 mV	_____	Vout + 80 mV
High Voltage Vout	79.92 V	_____	80.08 V
Measurement Readback	Vout – 160 mV	_____	Vout + 160 mV
CV Load Effect	– 17 mV	_____	+ 17 mV
CV Source Effect	– 10 mV	_____	+ 10 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	80 mV
rms	N/A	_____	25 mV
Transient Response			
Voltage @ 1 ms	– 400 mV	_____	+ 400 mV
Current Programming & Readback			
Minimum Current Iout	168 mA	_____	336 mA
Measurement Readback	Iout – 126 mA	_____	Iout + 126 mA
High Current Iout	41.874 A	_____	42.126 A
Measurement Readback	Iout – 168 mA	_____	Iout + 168 mA
CC Load Effect	– 13.4 mA	_____	+ 13.4 mA
CC Source Effect	– 6.2 mA	_____	+ 6.2 mA

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

Test Description	N8738A Settings
Voltage Programming & Readback, Min Voltage	200 mV, 252 mA
Voltage Programming & Readback, High Voltage	80V, 252 mA
CV Load Effect, Source Effect, Ripple and Noise	80V, 42A
Transient Response	80V, from 4.2A to 37.8A
Current Programming & Readback, Min Current	252 mA, 80V
Current Programming & Readback, High Current	42A, 80V
CC Load Effect, Source Effect	42A, 80V

N8738A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	7 – N3305A
Fixed Resistor for CV Ripple and Noise	1.9Ω 3.5 kW

Test Record – Keysight N8739A [100V, 33A, 3.3kW]

Keysight N8739A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	200 mV	_____	300 mV
Measurement Readback	Vout – 100 mV	_____	Vout + 100 mV
High Voltage Vout	99.9 V	_____	100.1 V
Measurement Readback	Vout – 200 mV	_____	Vout + 200 mV
CV Load Effect	– 20 mV	_____	+ 20 mV
CV Source Effect	– 12 mV	_____	+ 12 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	100 mV
rms	N/A	_____	25 mV
Transient Response			
Voltage @ 1 ms	– 500 mV	_____	+ 500 mV
Current Programming & Readback			
Minimum Current Iout	132 mA	_____	264 mA
Measurement Readback	Iout – 99 mA	_____	Iout + 99 mA
High Current Iout	32.901 A	_____	33.099 A
Measurement Readback	Iout – 132 mA	_____	Iout + 132 mA
CC Load Effect	– 11.6 mA	_____	+ 11.6 mA
CC Source Effect	– 5.3 mA	_____	+ 5.3 mA

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

Test Description	N8739A Settings
Voltage Programming & Readback, Min Voltage	250 mV, 198 mA
Voltage Programming & Readback, High Voltage	100V, 198 mA
CV Load Effect, Source Effect, Ripple and Noise	100V, 33A
Transient Response	100V, from 3.3A to 29.7A
Current Programming & Readback, Min Current	198 mA, 100V
Current Programming & Readback, High Current	33A, 100V
CC Load Effect, Source Effect	33A, 100V

N8739A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	7 – N3305A
Fixed Resistor for CV Ripple and Noise	3.0Ω 3.5 kW

Test Record – Keysight N8740A [150V, 22A, 3.3kW]

Keysight N8740A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	300 mV	_____	450 mV
Measurement Readback	Vout – 150 mV	_____	Vout + 150 mV
High Voltage Vout	149.85 V	_____	150.15 V
Measurement Readback	Vout – 300 mV	_____	Vout + 300 mV
CV Load Effect	– 27.5 mV	_____	+ 27.5 mV
CV Source Effect	– 17 mV	_____	+ 17 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	100 mV
rms	N/A	_____	25 mV
Transient Response			
Voltage @ 2 ms	– 750 mV	_____	+ 750 mV
Current Programming & Readback			
Minimum Current Iout	88 mA	_____	176 mA
Measurement Readback	Iout – 66 mA	_____	Iout + 66 mA
High Current Iout	21.934 A	_____	22.066 A
Measurement Readback	Iout – 88 mA	_____	Iout + 88 mA
CC Load Effect	– 9.4 mA	_____	+ 9.4 mA
CC Source Effect	– 4.2 mA	_____	+ 4.2 mA

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

Test Description	N8740A Settings
Voltage Programming & Readback, Min Voltage	375 mV, 132 mA
Voltage Programming & Readback, High Voltage	150V, 132 mA
CV Load Effect, Source Effect, Ripple and Noise	150V, 22A
Transient Response	150V, from 2.2A to 19.8A
Current Programming & Readback, Min Current	132 mA, 150V
Current Programming & Readback, High Current	22A, 150V
CC Load Effect, Source Effect	22A, 150V

N8740A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	7 – N3305A
Fixed Resistor for CV Ripple and Noise	6.8Ω 3.5 kW

Test Record – Keysight N8741A [300V, 11A, 3.3kW]

Keysight N8741A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	600 mV	_____	900 mV
Measurement Readback	Vout – 300 mV	_____	Vout + 300 mV
High Voltage Vout	299.7 V	_____	300.3 V
Measurement Readback	Vout – 600 mV	_____	Vout + 600 mV
CV Load Effect	– 50 mV	_____	+ 50 mV
CV Source Effect	– 32 mV	_____	+ 32 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	300 mV
rms	N/A	_____	100 mV
Transient Response			
Voltage @ 2 ms	– 1.5V	_____	+ 1.5V
Current Programming & Readback			
Minimum Current Iout	44 mA	_____	88 mA
Measurement Readback	Iout – 33 mA	_____	Iout + 33 mA
High Current Iout	10.967 A	_____	11.033 A
Measurement Readback	Iout – 44 mA	_____	Iout + 44 mA
CC Load Effect	– 7.2 mA	_____	+ 7.2 mA
CC Source Effect	– 3.1 mA	_____	+ 3.1 mA

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

Test Description	N8741A Settings
Voltage Programming & Readback, Min Voltage	750 mV, 66 mA
Voltage Programming & Readback, High Voltage	300V, 66 mA
CV Load Effect, Source Effect, Ripple and Noise	300V, 11A
Transient Response	200V, from 1.1A to 9.9A
Current Programming & Readback, Min Current	66 mA, 300V
Current Programming & Readback, High Current	11A, 300V
CC Load Effect, Source Effect	11A, 300V

N8741A Load Requirements	
Current shunt	0.1Ω 15 A
Use fixed resistor instead of load modules	27.3Ω 3.5 kW (or Amrel 5KW 600V 300A electronic load)
Fixed Resistor for CV Ripple and Noise	27.3Ω 3.5 kW

Test Record – Keysight N8742A [600V, 5.5A, 3.3kW]

Keysight N8742A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	1.2 V	_____	1.8 V
Measurement Readback	Vout – 600 mV	_____	Vout + 600 mV
High Voltage Vout	599.4 V	_____	600.6 V
Measurement Readback	Vout – 1.2 V	_____	Vout + 1.2 V
CV Load Effect	– 95 mV	_____	+ 95 mV
CV Source Effect	– 62 mV	_____	+ 62 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	500 mV
rms	N/A	_____	120 mV
Transient Response			
Voltage @ 2 ms	– 3V	_____	+ 3V
Current Programming & Readback			
Minimum Current Iout	22 mA	_____	44 mA
Measurement Readback	Iout – 16.5 mA	_____	Iout + 16.5 mA
High Current Iout	5.4835 A	_____	5.5165 A
Measurement Readback	Iout – 22 mA	_____	Iout + 22 mA
CC Load Effect	– 6.1 mA	_____	+ 6.1 mA
CC Source Effect	– 2.6 mA	_____	+ 2.6 mA

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

Test Description	N8742A Settings
Voltage Programming & Readback, Min Voltage	1.5V, 33 mA
Voltage Programming & Readback, High Voltage	600V, 33 mA
CV Load Effect, Source Effect, Ripple and Noise	600V, 5.5A
Transient Response	200V, from 0.55A to 4.95A
Current Programming & Readback, Min Current	33 mA, 600V
Current Programming & Readback, High Current	5.5A, 600V
CC Load Effect, Source Effect	5.5A, 600V

N8742A Load Requirements	
Current shunt	0.1Ω 15 A
Use fixed resistor instead of load modules	109Ω 3.5 kW (or Amrel 5KW 600V 300A electronic load)
Fixed Resistor for CV Ripple and Noise	109Ω 3.5 kW

Test Record – Keysight N8754A [20V, 250A, 5kW]

Keysight N8754A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	40 mV	_____	70 mV
Measurement Readback	Vout – 25 mV	_____	Vout + 25 mV
High Voltage Vout	19.98 V	_____	20.02 V
Measurement Readback	Vout – 30 mV	_____	Vout + 30 mV
CV Load Effect	– 8 mV	_____	+ 8 mV
CV Source Effect	– 2 mV	_____	+ 2 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	75 mV
rms	N/A	_____	10 mV
Transient Response			
Voltage @ 1 ms	– 100 mV	_____	+ 100 mV
Current Programming & Readback			
Minimum Current Iout	1 A	_____	2.5 A
Measurement Readback	Iout – 750 mA	_____	Iout + 750 mA
High Current Iout	249 A	_____	251 A
Measurement Readback	Iout – 1.0 A	_____	Iout + 1.0 A
CC Load Effect	– 250 mA	_____	+ 250 mA
CC Source Effect	– 125 mA	_____	+ 125 mA

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

Test Description	N8754A Settings
Voltage Programming & Readback, Min Voltage	55mV, 1.75A
Voltage Programming & Readback, High Voltage	20V, 1.75A
CV Load Effect, Source Effect, Ripple and Noise	20V, 250A
Transient Response	20V, from 25A to 225A
Current Programming & Readback, Min Current	1.75A, 20V
Current Programming & Readback, High Current	250A, 20V
CC Load Effect, Source Effect	250A, 20V

N8754A Load Requirements	
Current shunt	0.001Ω 300 A
Keysight N3300 Electronic load modules	9 – N3306A
Fixed Resistor for CV Ripple and Noise	0.08Ω 5.5 kW

Test Record – Keysight N8755A [30V, 170A, 5kW]

Keysight N8755A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	60 mV	_____	105 mV
Measurement Readback	Vout – 37.5 mV	_____	Vout + 37.5 mV
High Voltage Vout	29.97 V	_____	30.03 V
Measurement Readback	Vout – 45 mV	_____	Vout + 45 mV
CV Load Effect	– 9.5 mV	_____	+ 9.5 mV
CV Source Effect	– 3 mV	_____	+ 3 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	75 mV
rms	N/A	_____	10 mV
Transient Response			
Voltage @ 1 ms	– 150 mV	_____	+ 150 mV
Current Programming & Readback			
Minimum Current Iout	0.68 A	_____	1.70 A
Measurement Readback	Iout – 510 mA	_____	Iout + 510 mA
High Current Iout	169.32 A	_____	170.68 A
Measurement Readback	Iout – 680 mA	_____	Iout + 680 mA
CC Load Effect	– 170 mA	_____	+ 170 mA
CC Source Effect	– 85 mA	_____	+ 85 mA

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

Test Description	N8755A Settings
Voltage Programming & Readback, Min Voltage	82.5mV, 1.19A
Voltage Programming & Readback, High Voltage	30V, 680 mA
CV Load Effect, Source Effect, Ripple and Noise	30V, 170 A
Transient Response	30V, from 17A to 153A
Current Programming & Readback, Min Current	680 mA, 30V
Current Programming & Readback, High Current	170A, 30V
CC Load Effect, Source Effect	170A, 30V

N8755A Load Requirements	
Current shunt	0.001Ω 300 A
Keysight N3300 Electronic load modules	9 – N3306A
Fixed Resistor for CV Ripple and Noise	0.176Ω 5.5 kW

Test Record – Keysight N8756A [40V, 125A, 5kW]

Keysight N8756A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	80 mV	_____	140 mV
Measurement Readback	Vout – 50 mV	_____	Vout + 50 mV
High Voltage Vout	39.96 V	_____	40.04 V
Measurement Readback	Vout – 60 mV	_____	Vout + 60 mV
CV Load Effect	– 11 mV	_____	+ 11 mV
CV Source Effect	– 4 mV	_____	+ 4 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	75 mV
rms	N/A	_____	10 mV
Transient Response			
Voltage @ 1 ms	– 200 mV	_____	+ 200 mV
Current Programming & Readback			
Minimum Current Iout	0.50 A	_____	1.25 A
Measurement Readback	Iout – 375 mA	_____	Iout + 375 mA
High Current Iout	124.5 A	_____	125.5 A
Measurement Readback	Iout – 500 mA	_____	Iout + 500 mA
CC Load Effect	– 125 mA	_____	+ 125 mA
CC Source Effect	– 62.5 mA	_____	+ 62.5 mA

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

Test Description	N8756A Settings
Voltage Programming & Readback, Min Voltage	110 mV, 875 mA
Voltage Programming & Readback, High Voltage	40V, 875 mA
CV Load Effect, Source Effect, Ripple and Noise	40V, 125A
Transient Response	40V, from 12.5A to 112.5A
Current Programming & Readback, Min Current	875 mA, 40V
Current Programming & Readback, High Current	125A, 40V
CC Load Effect, Source Effect	125A, 40V

N8756A Load Requirements	
Current shunt	0.001Ω 300 A
Keysight N3300 Electronic load modules	9 – N3306A
Fixed Resistor for CV Ripple and Noise	0.32Ω 5.5 kW

Test Record – Keysight N8757A [60V, 85A, 5kW]

Keysight N8757A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	120 mV	_____	210 mV
Measurement Readback	Vout – 75 mV	_____	Vout + 75 mV
High Voltage Vout	59.94 V	_____	60.06 V
Measurement Readback	Vout – 90 mV	_____	Vout + 90 mV
CV Load Effect	– 14 mV	_____	+ 14 mV
CV Source Effect	– 6 mV	_____	+ 6 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	75 mV
rms	N/A	_____	10 mV
Transient Response			
Voltage @ 1 ms	– 300 mV	_____	+ 300 mV
Current Programming & Readback			
Minimum Current Iout	340 mA	_____	850 mA
Measurement Readback	Iout – 255 mA	_____	Iout +255 mA
High Current Iout	84.66 A	_____	85.34 A
Measurement Readback	Iout – 340 mA	_____	Iout + 340 mA
CC Load Effect	– 85 mA	_____	+ 85 mA
CC Source Effect	– 42.5 mA	_____	+ 42.5 mA

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

Test Description	N8757A Settings
Voltage Programming & Readback, Min Voltage	165mV, 595mA
Voltage Programming & Readback, High Voltage	60V, 595mA
CV Load Effect, Source Effect, Ripple and Noise	60V, 85A
Transient Response	60V, from 8.5A to 76.5A
Current Programming & Readback, Min Current	595mA, 60V
Current Programming & Readback, High Current	85A, 60V
CC Load Effect, Source Effect	85A, 60V

N8757A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	9 – N3306A
Fixed Resistor for CV Ripple and Noise	0.705Ω 5.5 kW

Test Record – Keysight N8758A [80V, 65A, 5kW]

Keysight N8758A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	160 mV	_____	280 mV
Measurement Readback	Vout – 100 mV	_____	Vout + 100 mV
High Voltage Vout	79.92 V	_____	80.08 V
Measurement Readback	Vout – 120 mV	_____	Vout + 120 mV
CV Load Effect	– 17 mV	_____	+ 17 mV
CV Source Effect	– 8 mV	_____	+ 8 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	100 mV
rms	N/A	_____	15 mV
Transient Response			
Voltage @ 1 ms	– 400 mV	_____	+ 400 mV
Current Programming & Readback			
Minimum Current Iout	260 mA	_____	650 mA
Measurement Readback	Iout – 195 mA	_____	Iout + 195 mA
High Current Iout	64.74 A	_____	65.26 A
Measurement Readback	Iout – 260 mA	_____	Iout + 260 mA
CC Load Effect	– 65 mA	_____	+ 65 mA
CC Source Effect	– 32.5 mA	_____	+ 32.5 mA

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

Test Description	N8758A Settings
Voltage Programming & Readback, Min Voltage	220mV, 455mA
Voltage Programming & Readback, High Voltage	80V, 455mA
CV Load Effect, Source Effect, Ripple and Noise	80V, 65A
Transient Response	80V, from 6.5A to 58.5A
Current Programming & Readback, Min Current	455mA, 80V
Current Programming & Readback, High Current	65A, 80V
CC Load Effect, Source Effect	65A, 80V

N8758A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	11 – N3305A
Fixed Resistor for CV Ripple and Noise	1.23Ω 5.5 kW

Test Record – Keysight N8759A [100V, 50A, 5kW]

Keysight N8759A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	200 mV	_____	350 mV
Measurement Readback	Vout – 125 mV	_____	Vout + 125 mV
High Voltage Vout	99.9 V	_____	100.1 V
Measurement Readback	Vout – 150 mV	_____	Vout + 150 mV
CV Load Effect	– 20 mV	_____	+ 20 mV
CV Source Effect	– 10 mV	_____	+ 10 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	100 mV
rms	N/A	_____	15 mV
Transient Response			
Voltage @ 1 ms	– 500 mV	_____	+ 500 mV
Current Programming & Readback			
Minimum Current Iout	200 mA	_____	500 mA
Measurement Readback	Iout – 150 mA	_____	Iout +150 mA
High Current Iout	49.8 A	_____	50.2 A
Measurement Readback	Iout – 200 mA	_____	Iout + 200 mA
CC Load Effect	– 50 mA	_____	+ 50 mA
CC Source Effect	– 25 mA	_____	+ 25 mA

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

Test Description	N8759A Settings
Voltage Programming & Readback, Min Voltage	275mV, 350mA
Voltage Programming & Readback, High Voltage	100V, 350mA
CV Load Effect, Source Effect, Ripple and Noise	100V, 50A
Transient Response	100V, from 5A to 45A
Current Programming & Readback, Min Current	350mA, 100V
Current Programming & Readback, High Current	50A, 100V
CC Load Effect, Source Effect	50A, 100V

N8759A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	11 – N3305A
Fixed Resistor for CV Ripple and Noise	2.0Ω 5.5 kW

Test Record – Keysight N8760A [150V, 34A, 5kW]

Keysight N8760A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	300 mV	_____	525 mV
Measurement Readback	Vout – 187.5 mV	_____	Vout + 187.5 mV
High Voltage Vout	149.85 V	_____	150.15 V
Measurement Readback	Vout – 225 mV	_____	Vout + 225 mV
CV Load Effect	– 27.5 mV	_____	+ 27.5 mV
CV Source Effect	– 15 mV	_____	+ 15 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	120 mV
rms	N/A	_____	25 mV
Transient Response			
Voltage @ 2 ms	– 750 mV	_____	+ 750 mV
Current Programming & Readback			
Minimum Current Iout	136 mA	_____	340 mA
Measurement Readback	Iout – 102 mA	_____	Iout + 102 mA
High Current Iout	33.864 A	_____	34.136 A
Measurement Readback	Iout – 136 mA	_____	Iout + 136 mA
CC Load Effect	– 34 mA	_____	+ 34 mA
CC Source Effect	– 17 mA	_____	+ 17 mA

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

Test Description	N8760A Settings
Voltage Programming & Readback, Min Voltage	412.5mV, 238mA
Voltage Programming & Readback, High Voltage	150V, 238mA
CV Load Effect, Source Effect, Ripple and Noise	150V, 34A
Transient Response	150V, from 3.4A to 30.6A
Current Programming & Readback, Min Current	238mA, 150V
Current Programming & Readback, High Current	34A, 150V
CC Load Effect, Source Effect	34A, 150V

N8760A Load Requirements	
Current shunt	0.01Ω 100 A
Keysight N3300 Electronic load modules	11 – N3305A
Fixed Resistor for CV Ripple and Noise	4.4Ω 5.5 kW

Test Record – Keysight N8761A [300V, 17A, 5kW]

Keysight N8761A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	0.60 V	_____	1.05 V
Measurement Readback	Vout – 375 mV	_____	Vout + 375 mV
High Voltage Vout	299.7 V	_____	300.3 V
Measurement Readback	Vout – 450 mV	_____	Vout + 450 mV
CV Load Effect	– 50 mV	_____	+ 50 mV
CV Source Effect	– 30 mV	_____	+ 30 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	300 mV
rms	N/A	_____	60 mV
Transient Response			
Voltage @ 2 ms	– 1.5V	_____	+ 1.5V
Current Programming & Readback			
Minimum Current Iout	68 mA	_____	170 mA
Measurement Readback	Iout – 51 mA	_____	Iout + 51 mA
High Current Iout	16.932 A	_____	17.068 A
Measurement Readback	Iout – 68 mA	_____	Iout + 68 mA
CC Load Effect	– 17 mA	_____	+ 17 mA
CC Source Effect	– 8.5 mA	_____	+ 8.5 mA

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

Test Description	N8761A Settings
Voltage Programming & Readback, Min Voltage	825mV, 119mA
Voltage Programming & Readback, High Voltage	300V, 119mA
CV Load Effect, Source Effect, Ripple and Noise	300V, 17A
Transient Response	200V, from 1.7A to 15.3A
Current Programming & Readback, Min Current	119mA, 300V
Current Programming & Readback, High Current	17A, 300V
CC Load Effect, Source Effect	17A, 300V

N8761A Load Requirements	
Current shunt	0.1Ω 15 A
Use fixed resistor instead of load modules	17.6Ω 5.5 kW (or Amrel 5KW 600V 300A electronic load)
Fixed Resistor for CV Ripple and Noise	17.6Ω 5.5 kW

Test Record – Keysight N8762A [600V, 8.5A, 5kW]

Keysight N8762A Description	Report No _____ Minimum Specs.	Date _____ Results	Maximum Specs.
Voltage Programming & Readback			
Minimum Voltage Vout	1.2 V	_____	2.1 V
Measurement Readback	Vout – 750 mV	_____	Vout + 750 mV
High Voltage Vout	599.4 V	_____	600.6 V
Measurement Readback	Vout – 900 mV	_____	Vout + 900 mV
CV Load Effect	– 95 mV	_____	+ 95 mV
CV Source Effect	– 60 mV	_____	+ 60 mV
CV Ripple and Noise			
peak-to-peak	N/A	_____	500 mV
rms	N/A	_____	120 mV
Transient Response			
Voltage @ 2 ms	– 3V	_____	+ 3V
Current Programming & Readback			
Minimum Current Iout	34 mA	_____	85 mA
Measurement Readback	Iout – 25.5 mA	_____	Iout + 25.5 mA
High Current Iout	8.466 A	_____	8.534 A
Measurement Readback	Iout – 34 mA	_____	Iout + 34 mA
CC Load Effect	– 8.5 mA	_____	+ 8.5 mA
CC Source Effect	– 4.3 mA	_____	+ 4.3 mA

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

Test Description	N8762A Settings
Voltage Programming & Readback, Min Voltage	1.65V, 59.5mA
Voltage Programming & Readback, High Voltage	600V, 59.5mA
CV Load Effect, Source Effect, Ripple and Noise	600V, 8.5A
Transient Response	200V, from 0.85A to 7.65A
Current Programming & Readback, Min Current	59.5mA, 600V
Current Programming & Readback, High Current	8.5A, 600V
CC Load Effect, Source Effect	8.5A, 600V

N8762A Load Requirements	
Current shunt	0.1Ω 15 A
Use fixed resistor instead of load modules	70.6Ω 5.5 kW (or Amrel 5KW 600V 300A electronic load)
Fixed Resistor for CV Ripple and Noise	70.6Ω 5.5 kW

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 preformed (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

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.

KEYSIGHT TECHNOLOGIES

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

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

	Command Errors (continued)
–141	**Invalid character data** Either the character data element contains an invalid character, or the element is not valid.
–144	**Character data too long** The character data element contains more than 12 characters.
–148	**Character data not allowed** A discrete parameter was received, but a string or numeric parameter was expected.
–150	**String data error** Generic string data error
–151	**Invalid string data** An invalid character string was received. Check that the string is enclosed in quotation marks.
–158	**String data not allowed** A character string was received, but is not allowed for this command.
–160	**Block data error** Generic block data error
–161	**Invalid block data** The number of data bytes sent does not match the number of bytes specified in the header.
–168	**Block data not allowed** Data was sent in arbitrary block format but is not allowed for this command.
–170	**Expression error** Generic expression error
–171	**Invalid expression data** The expression data element was invalid.
–178	**Expression data not allowed** Expression data element was sent but is not allowed for this command.

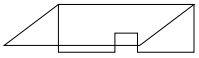
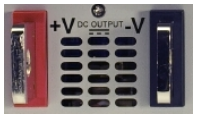
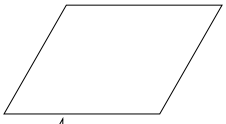
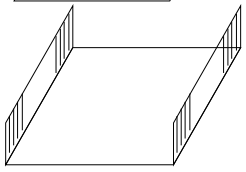
	Execution Errors (these errors set Standard Event Status register bit #4)
–200	**Execution error** Generic syntax error
–220	**Parameter error** A data element related error occurred.
–221	**Settings conflict** A data element could not be executed because of the present instrument state.
–222	**Data out of range** A data element could not be executed because the value was outside the valid range.
–223	**Too much data** A data element was received that contains more data than the instrument can handle.
–224	**Illegal parameter value** An exact value was expected but not received.
–225	**Out of memory** The device has insufficient memory to perform the requested operation.
–226	**Lists not same length** One or more lists are not the same length.
–230	**Data corrupt or stale** Possible invalid data. A new reading was started but not completed.

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

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

Recycling Plastic Components

The following table identifies the plastic components in your instrument that must be recycled when the instrument is disposed of.

Description, Qty, Material	Image	Description, Qty, Material	Image
Front panel – slotted (qty 1) CYCOLOY C6200		Fan pcb insulator – clear (qty 1) LEXAN FR60	
Voltage/current knobs (qty 2) CYCOLOY C6200		Airflow deflector – clear (qty 1) LEXAN FR60	
Pushbuttons (qty 6) CYCOLOY C6200		FET dust shield - clear (qty 2) LEXAN FR60	
Nameplate (qty 1) 8B35V		FET/diode insulator – pink, assorted sizes (qty varies) TC-30-CG	
Controls label (qty 1) 8010VC		Bus bar spacers – red, black (qty 2) VALOX 310 SEO	
Foot (qty 4) AR 790		Fan push-rivet – black (qty 12) NYLON 6	
Analog connector cover (qty 2) LEXAN 243R		PCB standoff – white (qty 5) NYLON 6/6	
Line cord strain relief (qty 1) Polyamide PA			
Display insulator – clear (qty 1) LEXAN FR60			
Cover insulator – clear (qty 1) LEXAN FR60			
Chassis insulator – clear (qty 1) LEXAN FR60			

Appendix D
Compatibility

The Keysight N8700 power supplies are programmatically compatible with the Keysight 603xA power supplies. This means that you can remotely program the Keysight N8700 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.

KEYSIGHT TECHNOLOGIES

Differences – In General

The following table documents the general differences between the way Compatibility commands work on the Keysight N8700 power supplies and the way they worked on the Keysight 603xA power supplies.

Item	Differences
Queries	The Keysight N8700 will respond to multiple queries. It will not allow a space separator between numbers. 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. Sending a second query without reading the response to the first will generate an error. Model number queries will only return the N8700 model numbers.
Status functions	Serial Poll will be controlled by the SCPI status model and will not act like a 603xA power supply. SRQ will be controlled by the SCPI status model. Parallel poll will not work.
Settings	The full-scale limits will match the Keysight N8700 limits.
Measurement	Floating point numbers returned by the instrument may not have exactly the same syntax or number of digits.
Calibration	Calibration must be done in SCPI.
Storage states	The Keysight N8700 units have 16 volatile states.

Compatibility Command Summary

The following table documents the compatibility commands that the Keysight N8700 power supplies support. All compatibility commands are accepted; however, some commands do nothing.

Compatibility Command	Description	Similar SCPI Command
ASTS? Note 1	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:EVEN? STAT:QUES:EVEN? *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? Note 1	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?
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?

Compatibility Command	Description	Similar SCPI Command
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? Note 1	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> Note 1	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? Note 1	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?`

Note 1: Compatibility status definitions and values are as follows

Status condition	Bit position	Bit weight
CV – constant voltage	0	1
CC – constant current	1	2
OR – overrange	2	4
OV – overvoltage tripped	3	8
OT – overtemperature tripped	4	16
AC – AC line voltge overage.dropout	5	32
FOLD – foldback tripped	6	64
ERR – programming error	7	128
RI – remote inhibit tripped	8	256

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KEYSIGHT TECHNOLOGIES

Keysight Technologies 系统直流电源

N8700 系列

快速参考指南

KEYSIGHT TECHNOLOGIES

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故障不承担任何责任。

一般原则

不要违反制造商的规定使用本产品。如不按照操作手册使用本产品，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，确保连接所有设备。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）。要将电击危险减到最低程度，必须将仪器机箱和外壳接地。必须通过接地电源电缆将仪器连接到交流电源，将接地电线牢固地连接到电源插座的接地（安全接地）端。中断保护（接地）导线或接地保护端子的连接，将导致潜在电击危险，从而造成人身伤害。

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。

不要卸下仪器外壳

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外壳。在卸下仪器外壳之前，要断开电源电缆和外部电路的连接。

不要调整仪器

不要安装代用零件或对产品擅自调整。请将产品返回是德销售和服务部接受服务和维修以确保保持其安全特性。

出现损坏时

仪器一旦出现损坏或故障迹象，应立即停止操作并防止误操作，等待合格人员进行修理。

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定，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定，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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目录

Keysight N8700 直流电源概览

Keysight Technologies N8700 系列系统直流电源是一种通用开关电源，2U（双机架装置）高度，它具有多种输出电压和电流额定值，并具有 3.3 kW 和 5 kW 两种型号。

这些电源已经过功率因数校正，具有灵活的交流输入电压选项。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和监视电源工作。

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。

系统功能

- 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。
- 有效的功率因数校正。
- 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

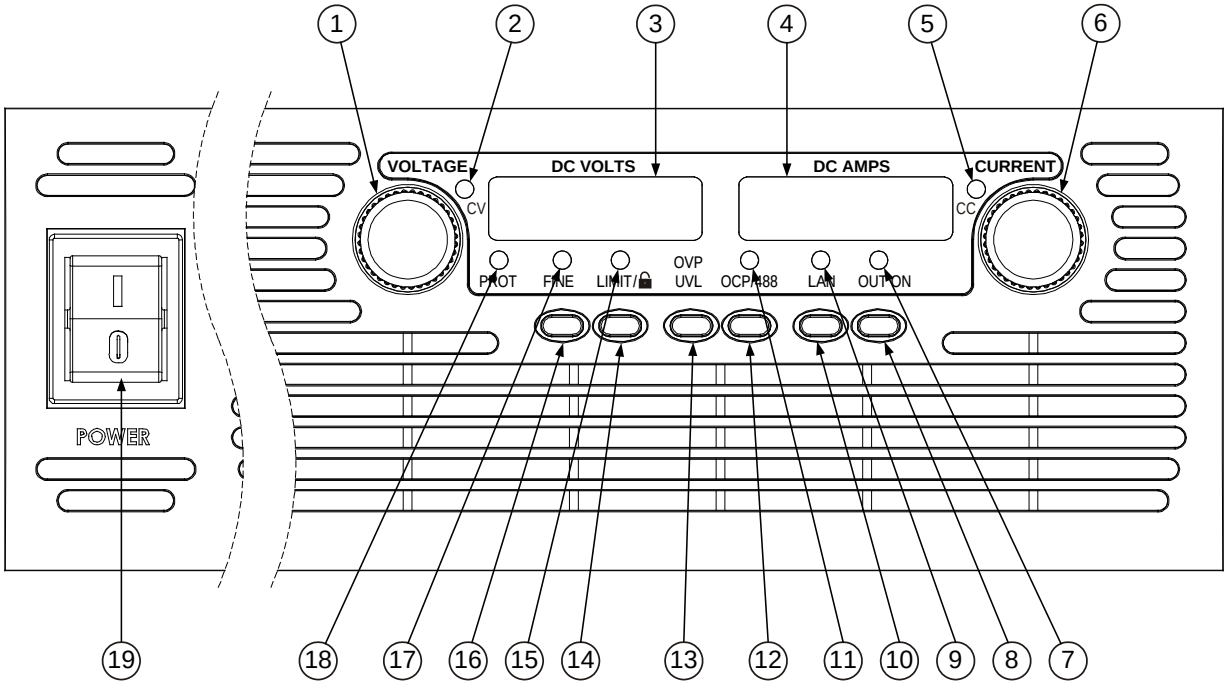
各种型号的额定值

3.3 kW 型号			**5 kW** 型号		
型号	**电压范围**	**电流范围**	型号	电压范围	电流范围
N8731A	0 – 8V	0 – 400A	N8754A	0 – 20V	0 – 250A
N8732A	0 – 10V	0 – 330A	N8755A	0 – 30V	0 – 170A
N8733A	0 – 15V	0 – 220A	N8756A	0 – 40V	0 – 125A
N8734A	0 – 20V	0 – 165A	N8757A	0 – 60V	0 – 85A
N8735A	0 – 30V	0 – 110A	N8758A	0 – 80V	0 – 65A
N8736A	0 – 40V	0 – 85A	N8759A	0 – 100V	0 – 50A
N8737A	0 – 60V	0 – 55A	N8760A	0 – 150V	0 – 34A
N8738A	0 – 80V	0 – 42A	N8761A	0 – 300V	0 – 17A
N8739A	0 – 100V	0 – 33A	N8762A	0 – 600V	0 – 8.5A
N8740A	0 – 150V	0 – 22A			
N8741A	0 – 300V	0 – 11A			
N8742A	0 – 600V	0 – 5.5A			

注意 1：最小输出电压 ≤ 额定输出电压的 0.2%。

注意 2：最小输出电流 ≤ 额定输出电流的 0.4%。

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。按 FINE 按钮设置微调分辨率。

GPIB 地址：按住 OCP/488 时，可选择 GPIB 地址。

2 – VOLTAGE（电压）指示灯

表示设备处于恒压模式 – 输出电压保持恒定不变。

3 – DC VOLTS（直流电压）显示屏

通常显示感测端子测得的电压。

- 表示按下 LIMIT 按钮时设定的电压设置。
- 表示按下 OVP/UVL 按钮时的 OVP 或 UVL 设置。
- 表示按住 OCP/488 按钮时的 GPIB 地址。
- 表示按住 LAN 按钮时的 IP 和 Ethernet 地址。

4 – DC AMPS（直流电流）显示屏

通常显示输出端子测得的电流。

- 表示按下 LIMIT 按钮时设定的电流设置。
- 表示按住 LAN 按钮时的 IP 和 Ethernet 地址。

5 – CURRENT（电流）指示灯

表示设备处于恒流模式 – 输出电流保持恒定不变。

6 – CURRENT（电流）旋钮

调节输出电流。按 FINE 按钮设置微调分辨率。

7 – OUT ON（开启输出）指示灯

表示已启用或开启输出。

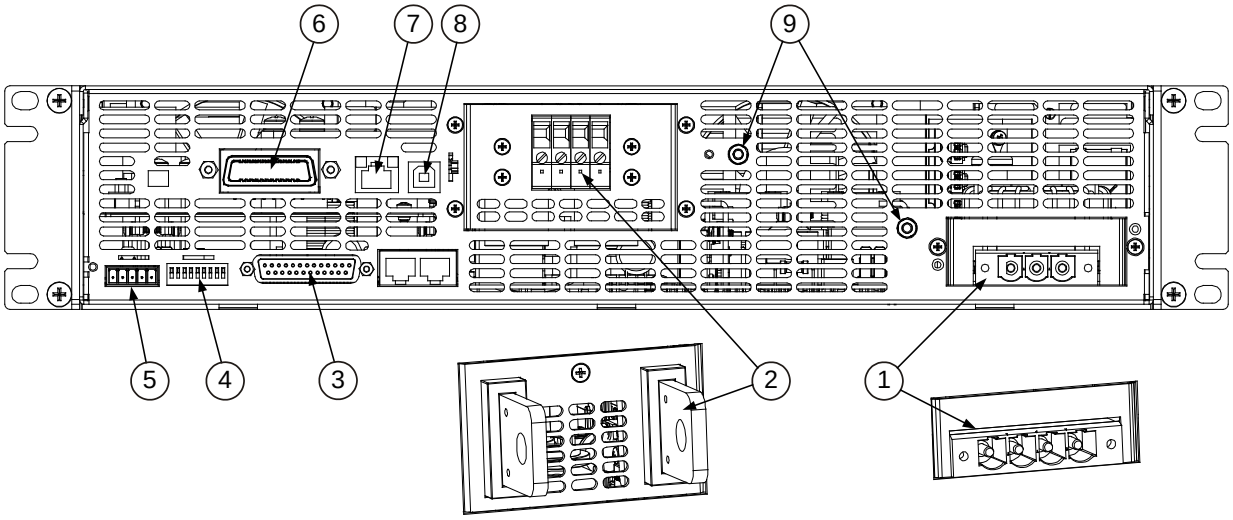
8 – OUT ON（开启输出）按钮

输出功能：按 OUT ON 按钮可开启或关闭输出。按 OUT ON 按钮重置设备并在 OVP 或 OCP 事件完成后将输出恢复为开启状态。

启动功能：按住 OUT ON 按钮可在安全启动和自动重启模式之间进行切换。显示将在 SAF 和 AU7 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。

9 – LAN 指示灯	表示 LAN 已配置完毕并正常工作。在 N8700 设备的 Web 主页上设置另一个设备，LAN 指示灯会闪烁以指示该设备。
10 – LAN 按钮	查看地址：按 LAN 按钮可查看 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，请参阅第 4 章）。如果不再次按下 LAN 按钮，屏幕将恢复为正常模式且配置不会发生更改。
11 – OCP/488（过电流保护）指示灯	表示已启用或开启过电流保护功能。
12 – OCP/488（过电流保护）按钮	启用 OCP：按 OCP/488 按钮可开启过电流保护功能。再次按 OCP/488 按钮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，可使用 Voltage（电压）旋钮设置 GPIB 地址。
13 – OVP/UVL（过电压保护/欠电压限值）按钮	OVP 功能：按 OVP/UVL 按钮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 (LFP) 和“未锁定”前面板 (UFP) 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	表示已按下 LIMIT 按钮。
16 – FINE（微调）按钮	设置电压和电流旋钮的“微调”或“粗调”控制。 按 FINE 按钮设置“微调”模式；再按一下可返回“粗调”模式。 - 微调模式：具有高分辨率的旋钮操作。 - 粗调模式：具有低分辨率（大约 6 转）的旋钮操作。
17 – FINE（微调）指示灯	表示设备处于高分辨率“微调”模式。
18 – PROT（保护）指示灯	发生故障时闪烁。 OVP、OCP、OTP、启用失败以及交流故障都将导致 PROT（保护）指示灯闪烁。设备关闭后，PROT 指示灯可能闪烁，屏幕上将显示 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



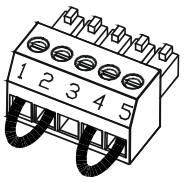
1 – 交流输入连接器	带配接插头（适用于 3.3 kW 和 5 kW 输出型号）的接头 为单相 VAC 提供三导线插头。 为三相 VAC 提供四导线插头。
2 – 直流输出连接器	150V、300V 和 600V 型号的线夹连接器；8V 至 100V 型号的母线
3 – 模拟编程连接器	用于模拟接口的连接器。包括输出电压和电流限值编程和监视信号、关断控制（电子信号）、启用/禁用控制（干触点）、电源正常 (Power Supply OK) 信号和工作模式 (CV/CC) 信号。（请参见下一页以了解详细信息）
4 – SW1 设置开关	共有九个开关位置，用于为输出电压、电流限值和其他控制功能选择远程编程和监视模式。（请参见下一页以了解详细信息）
5 – 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）
6 – GPIB 连接器	连接 GPIB 接口的连接器。（请参见第 4 章以了解设置信息）
7 – LAN 连接器	连接 LAN 接口的连接器。LINK LED 表示链路完整性。TX LED 表示 LAN 活动状态。（请参见第 4 章以了解 LAN 设置信息）
8 – USB 连接器	连接 USB 接口的连接器。（请参见第 4 章以了解设置信息）
9 – 接地螺钉及螺母	用于进行机箱接地连接的 M4x8 螺钉及螺母。

警告

电击危险：AC 电源线通过接地导线提供机箱接地。确保对于单相设备型号，电源为三导线，对于四相设备型号，电源为四导线，并且接地导线（绿色/黄色）接地。

J2 感测连接器

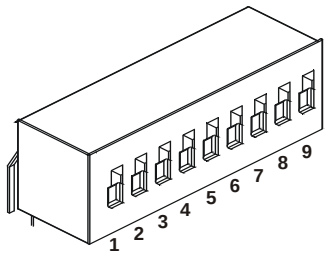
1 – 远程感测 **(+)**
2 – 本地感测 **(+)**
3 – 未使用
4 – 本地感测 **(–)**
5 – 远程感测 **(–)**



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：	1.95 – 2.21 in-lb (0.22 – 0.25 Nm)

出厂配置如下图所示。

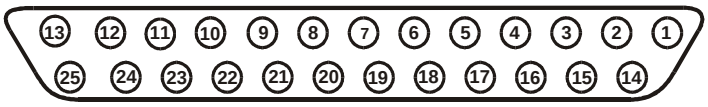
SW1 设置开关



出厂时，所有开关都设置为“下”位置。

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

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

抽取工具： AMP 部件号 91232-1 或等效工具

出厂默认配置为本地操作，不需要连接 J1。

针 **1**：	启用在	将针 1 连接到针 14 以启用输出（断开连接将禁用输出）
针 **2**、针 **3**：	机箱共用	针 15 和针 16（连接到机箱）的信号回路
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	用于输入输出电压的电压或电阻编程
针 **10**：	电流编程	用于输入输出电流的电压或电阻编程
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 的信号回路（参考到 –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（参考到机箱共用）
针 **16**：	电源正常	用于指示电源状态的输出（参考到机箱共用）
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（从内部连接到针 12）
针 **23**：	电流编程回路	用于针 10 的信号回路（参考到针 12）
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。**

小心 不要挡住仪器前面的进气口或设备后面的排气口。

只应在可控制的室内环境中操作本仪器。不要在环境温度达到 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 N8700 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：电源线通过接地导线提供机箱接地。确保已将电源线的接地导线连接到接地电源和仪器交流输入连接器。

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。

警告

连接到交流电源　电源必须通过断路器、保险丝等保护装置连接到交流电源，并具有下列额定功率：

对于单相设备型号：每相最大 30A

对于三相设备型号：每相最大 20A

小心

将 3.3 kW 或 5 kW 型号的电源连接到交流电源必须由合格的电工按照本地电气法规来完成。

POWER 打开/关闭开关不是主要的断电装置，因此不会完全切断通往交流电源的电流。用于永久或多相配置的断电装置可以是开关或断路器，必须在安装完成时提供。

断电装置必须符合 UL/CSA/EN 61010-1 要求的规定。它应距离设备较近并易于触及，同时应被标记为此设备的断电装置。断电装置的额定功率必须符合各设备前面板上的额定功率标签中标明的值。每个设备均带有下面一种无端接接头的电源线。必要时，可将适当的锁定型电源插头连接到电源线的末端。

电缆选件/零件号	说明	额定功率	导线规格	长度	审核标准
OPT 831, p/n 8121-1949	3.3kW 单相	300V, 25 A, 60°C	3 x 10 AWG 注 1 , 3	2.5 m	UL/CSA
OPT 832, p/n 8121-1331	3.3kW 单相	250V, 32 A, 60 °C	3 x 4 mm^2 注 1	2.5 m	协调一致
OPT 861, p/n 8121-1946	3.3kW/5kW 三相 (介于 190 至 240 VAC 标称值之间)	300V, 25 A, 90 °C	4 x 10 AWG 注 2 , 3	2.5 m	UL/CSA
OPT 862, p/n 8121-1948	3.3kW/5kW 三相 (介于 380 至 415 VAC 标称值之间)	450V, 20 A, 70 °C	4 x 2.5 mm^2 注 2	2.5 m	协调一致

注 1：双线外加一根绿色/黄色的安全接地导线

注 2：三线外加一根绿色/黄色的安全接地导线

注 3：10 AWG 对应 4mm^2

3.3 kW 和 5 kW 型号设备的输入连接

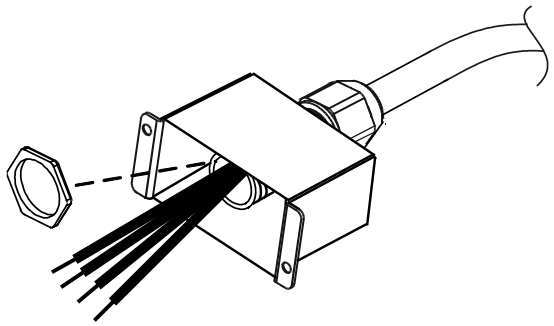
交流输入连接器位于后面板上。对于 3.3 kW 单相设备，为三端子线夹，对于 3.3 kW 和 5 kW 三相设备，则为四端子线夹。额定输入电压和电流如下：

设备	标准交流输入	输入电流（完全负载）	频率
3.3 kW 单相	190 – 240 VAC	最大 23 – 24 A	50/60 Hz
3.3 kW 三相	190 – 240 VAC	最大 13.6 – 14.5 A	50/60 Hz
	380 – 415 VAC	最大 6.8 – 7.2 A	50/60 Hz
5 kW 三相	190 – 240 VAC	最大 21 – 22 A	50/60 Hz
	380 – 415 VAC	最大 10.5 – 12 A	50/60 Hz

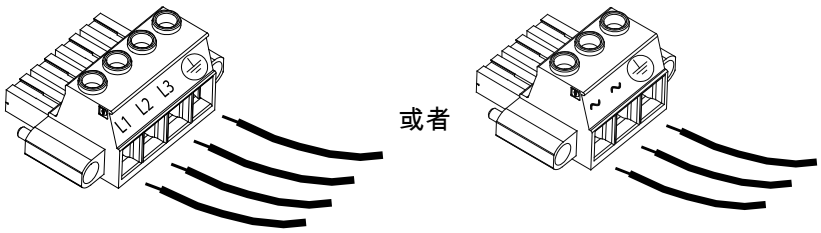
注意 您不能更改设备电线的额定电压。如果设备的电线额定电压与交流电源不符合，必须将其送回工厂以进行修复。

如下所述，将电缆连接到交流输入连接器：

1. 剥去大约 10 cm (4 in) 的交流电缆外部绝缘层。修剪导线，使绿色/黄色接地线比其他导线长 10 mm (0.4 in)。在每根导线的末端剥去 10 mm (0.4 in) 长的外皮。
2. 从电缆护套底座上拧下压紧螺母。将防松螺母放置到交流输入盖板的内部，使螺母平面正对着盖板。将底座穿过交流输入盖板的外部开口。从外部将防松螺母紧固在底座上。紧固扭矩：17 ft-lb (23 Nm)。
3. 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内边平齐。将扳手放在底座上，以防止其转动。现将防松螺母紧固到底座上，以防止其转动。紧固扭矩：14 – 16.2 ft-lb (19 – 22 Nm)。请参考下图。

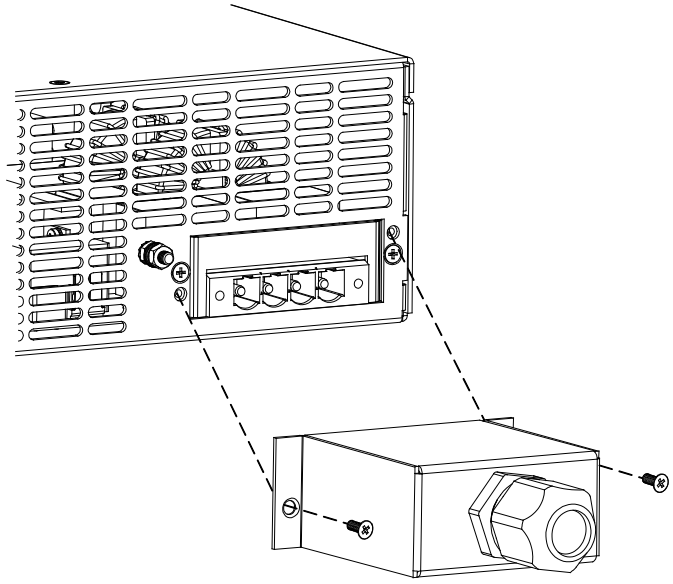


4 保持交流导线正确定位的同时将压紧螺母拧紧到底座上。根据需要将交流导线接到输入连接器端子上。要连接导线，请将端子螺钉拧松，将已剥皮导线插入端子，然后拧紧螺钉，如下图所示。确保已将绿色/黄色接地导线连接到连接器上的接地端子。将连接器插入后面板的插头中，并用螺母紧固每一侧。拧紧紧固扭矩：10.7 – 13.4 in-lb (1.2 – 1.5 Nm)。



插头型号：	PC 6/4-STF-10 、 16 或 PC 6/3-STF-10 、 16 Phoenix
导线规格：	18 AWG 到 8 AWG
剥皮长度：	12 mm (0.5 in.)
扭矩：	10.7 – 13.4 in-lb (1.2 – 1.5 Nm)

5 在盖板内布置导线，使其免受挤压，同时将盖板滑入后面板用作附件。使用随附的 M3 x 8mm 平头螺钉将盖板固定到设备上。拧紧紧固扭矩：4.8 in-lb (0.54 Nm)。请参考下图。



连接负载（8V 到 100V 型号）

警告

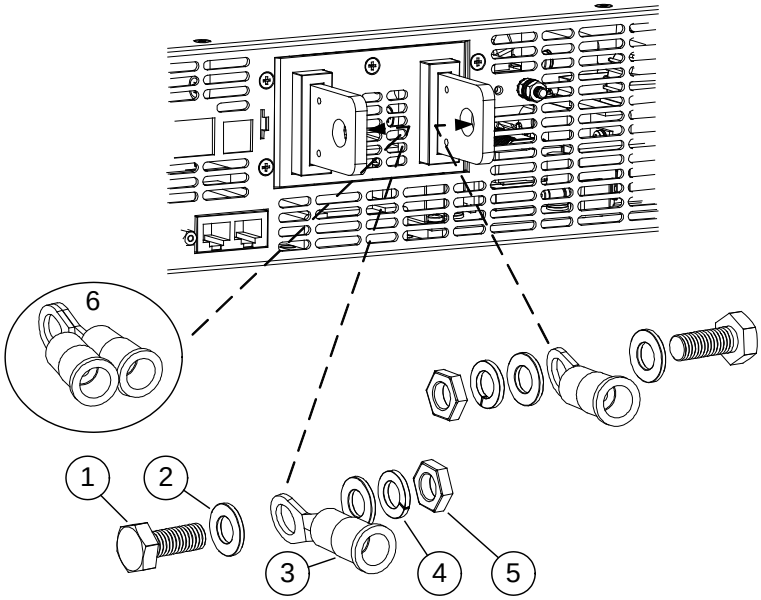
电击危险　进行后面板连接前，请关闭交流电源。所有导线和接线片必须正确连接，螺钉要拧紧。

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。

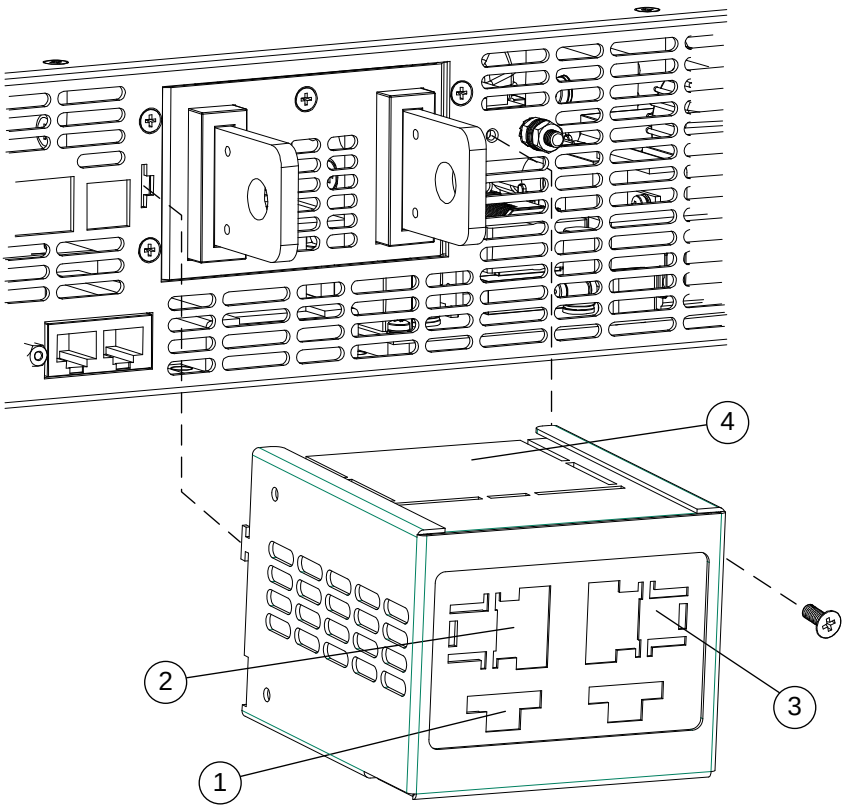
1　如下图所示，所有负载导线必须正确端接，接线片要连接牢固。请勿在电源上使用无端接接头的导线进行负载连接。将接线端子连接到母线*内部* 以确保具有足够的空间安装遮护板。



1 – 螺钉　**2 –** 平垫圈　**3 –** 接线片

4 – 弹簧垫圈　**5 –** 螺母　**6 –** 并联接线片

2　完成负载接线后，安装遮护板。必要时，可以拆除大规格导线的相应断流器，如下图所示。确保遮护板的左侧使用调整片，右侧使用 M3 x 8mm 平头螺钉。拧紧紧固扭矩：4.8 - 5.3 in-lb (0.54 – 0.6 Nm)。



1 – AWG 4 – 10 规格导线的开口。

2 – AWG 2 – 1/0 规格导线的开口。已拆除小型断流器。

3 – 为 **AWG 2/0 – 3/0** 规格导线拆除此断流器。

4 – 为总线轨道安装拆除此断流器。

连接负载（150V、300V 和 600V 型号）

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。

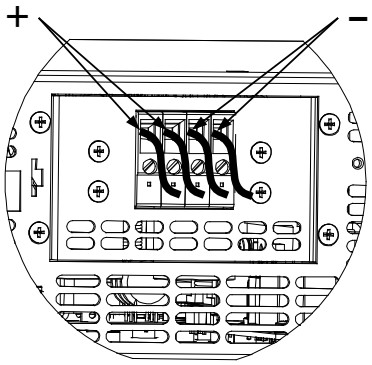
150V、300V 和 600V 型号有一个四端子线夹输出连接器。左边两个端子为正输出，右边两个端子为负输出。连接器规格如下：

导线规格：	18 AWG 到 10 AWG
剥皮长度：	10 mm (0.4 in.)
扭矩：	4.4 – 5.3 in-lb (0.5 – 0.6 Nm)。

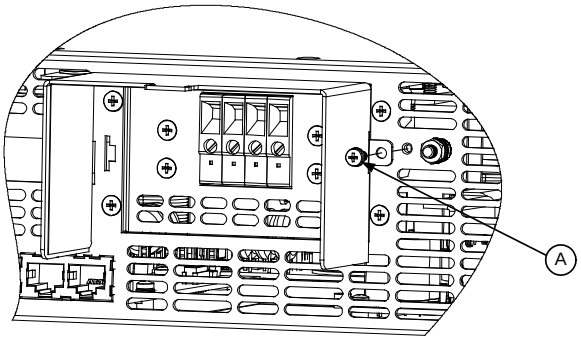
按下列步骤将负载导线连接到电源输出线夹连接器：

1 剥掉导线外皮大约 10 mm (0.4 in)。

2 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。



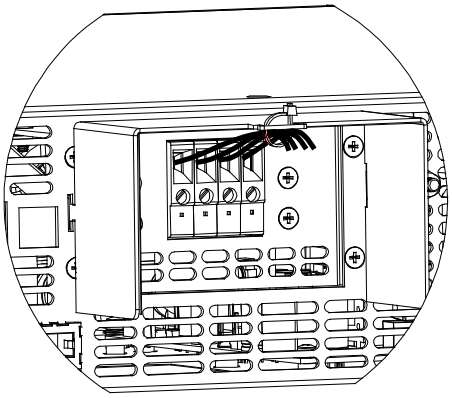
3 拧松标有 A 的机箱螺钉，然后将其取下并保存好。



4 将遮护板左侧上的槽形调整片滑入机箱插槽并固定到位。插入以前从遮护板右侧卸下的螺钉，将遮护板固定到机箱上。拧紧紧固扭矩：4.8 - 5.3 in-lb (0.54 – 0.6 Nm)。

5 将负载导线布置到遮护板顶部的调整片。确保遮护板内的导线足够长，以便能充分消除应力。

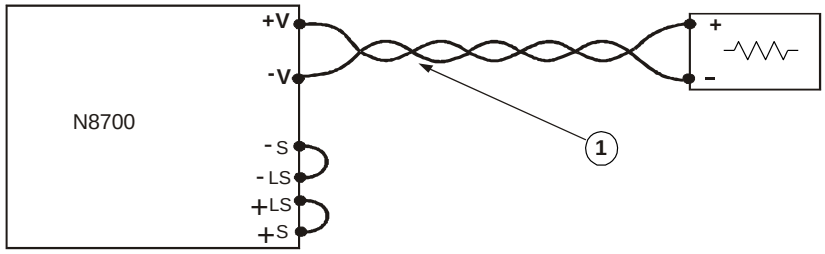
6 用束带或类似物将负载导线连接到锯齿状遮护板调整片，如下图所示。



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。

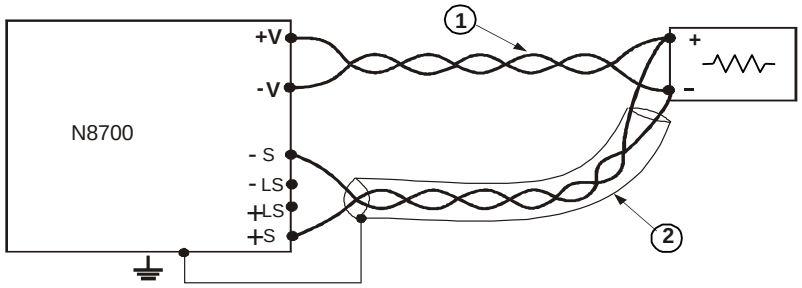


1 – 负载线 **=** 双绞线，要尽可能短

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）。



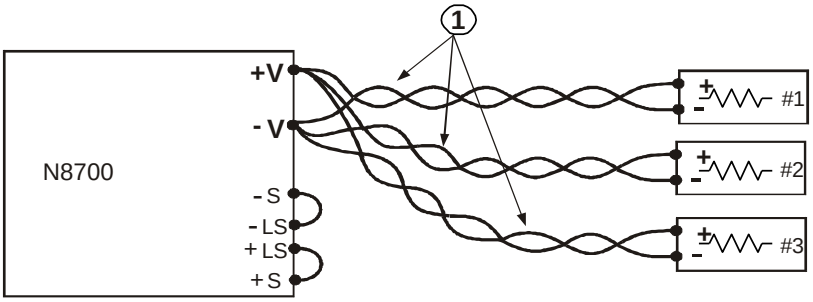
1 – 负载线 **=** 双绞线，要尽可能短

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。

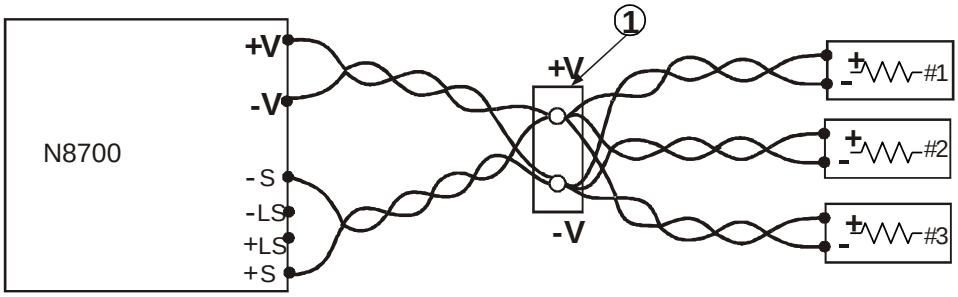


1 – 负载线 **=** 双绞线，要尽可能短

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。通过将一个输出端子接地，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 ±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 ±600 VDC 以外或低于机箱接地值。

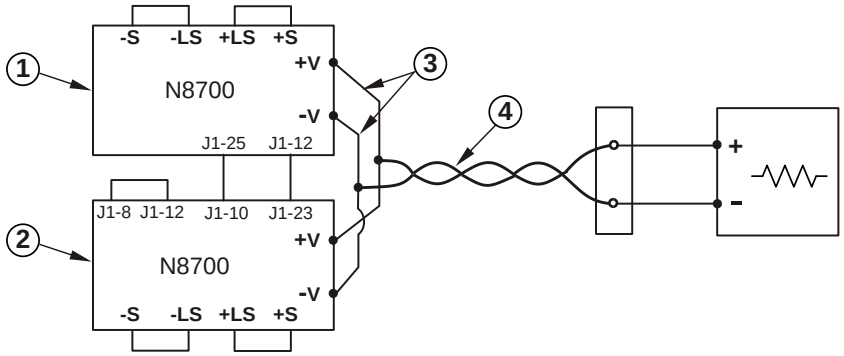
对于额定输出高于 60 VDC 的型号，负输出不得超出 ±400 VDC 以外或低于机箱接地值。

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。

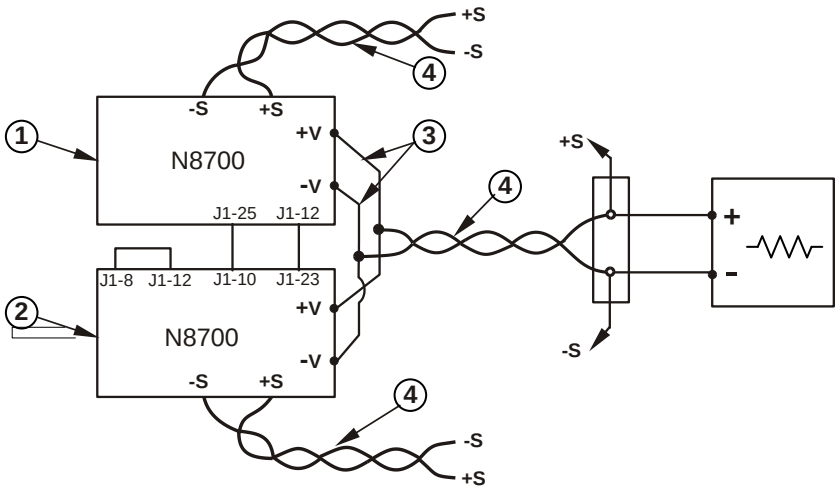
最多可将四个具有相同额定电压和电流的电源设备并联连接，以提供最高四倍的输出电流能力。下图显示两个电源设备，连接方式适用于四个电源设备。

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



远程感测

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）。将从电源设备的 J1 针 23（电流编程回路）连接到主电源设备的 J1 针 12（共用）。另外，在 J1 针 8 和 J1 针 12 之间连接一条短接线。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 ±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 ±600 VDC 以外或低于机箱接地值。

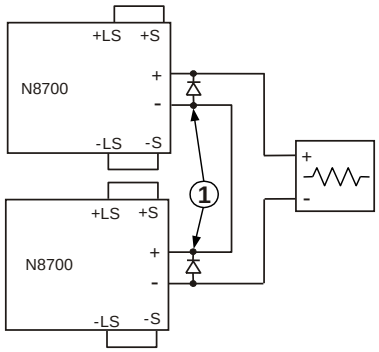
对于额定输出高于 60 VDC 的型号，负输出不得超出 ±400 VDC 以外或低于机箱接地值。

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。

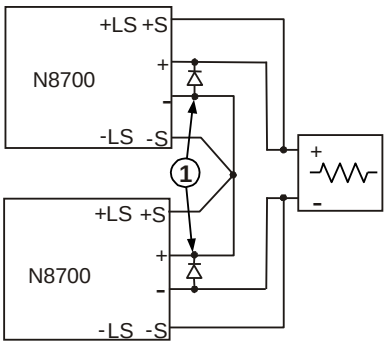
可将两个具有相同额定电压和电流的电源设备串行连接，以提供最高两倍的输出电压能力。由于串联电路中每个元件所通过的电流相同，串行连接的输出**必须**具有相同的电流额定值。

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。

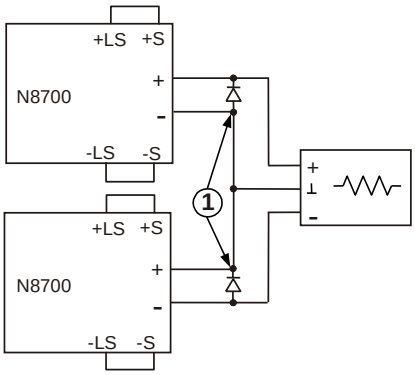
下图说明在本地和远程感测中进行的串行连接。它们还显示了配置为正输出和负输出的串联电源。



本地感测



远程感测



正输出和负输出

1 – 二极管由用户提供

正常工作方式

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 30 VDC 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 10 mA 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 - 15V 或断开	开启	电压/电流值
	0 – 0.4V 或短接	熄灭	SO
上	2 - 15V 或断开	熄灭	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，请不要将启用 + 或启用 – 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**	**启用 +/ 启用 –** 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	熄灭	启用	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

过电流保护

过热保护

交流线路故障

启用/禁用信号为真

关断信号为真

接口故障

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。

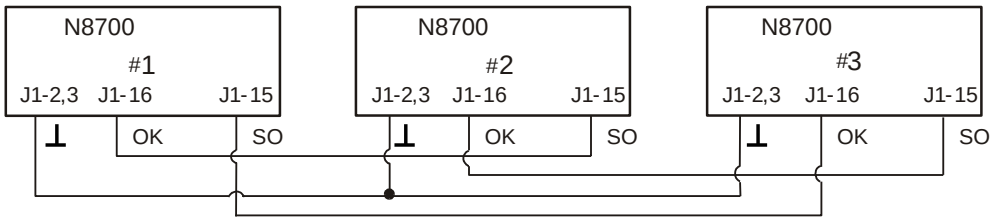
在自动重启模式下，电源将恢复到上一次关闭时保存的工作设置（请参见下面的列表）。根据上一次设置，输出可以为启用或禁用。

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

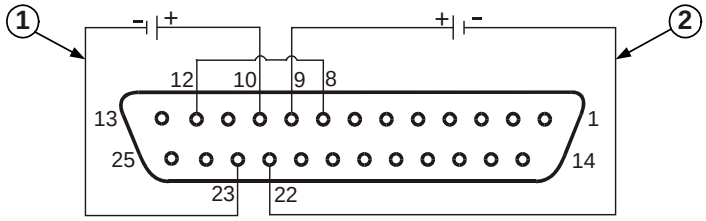
J1 针 12、针 22 和针 23 从内部连接到负感测端子。不要将这些针与该负感测端子外的任何端子进行连接，因为这样可能会对设备造成损坏。

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

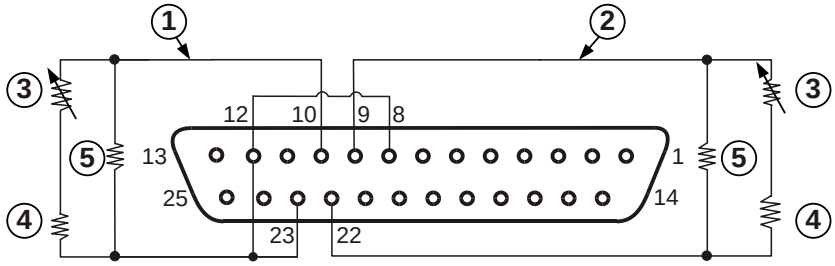
小心

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 kΩ 或 0 – 10 kΩ 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**）	电流编程（**J1** 针 **10**）
下（默认）	0 – 5 kΩ	0 – 5 kΩ
上	0 – 10 kΩ	0 – 10 kΩ

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 N8700 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 N8700

Aide-mémoire

KEYSIGHT TECHNOLOGIES

Mentions 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. Prenez note des 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 mise à la terre de protection). Afin de minimiser les risques d'électrocution, son châssis et son capot doivent être mis électriquement à la terre. L'instrument doit être relié à une source de courant alternatif par l'intermédiaire d'un cordon d'alimentation secteur pourvu d'un conducteur de terre raccordé électriquement à une terre (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 encourus peuvent démonter les capots de l'instrument. Débranchez systématiquement le cordon d'alimentation secteur et déconnectez 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 Keysight, afin d'être certain que les fonctions de sécurité seront conservées.

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 un personnel qualifié.

ATTENTION

La mention **ATTENTION** indique un risque. Si la procédure, le procédé ou les consignes s'y rapportant ne sont pas exécutés correctement, le produit risque d'être endommagé ou des données d'être perdues. En présence de la mention **ATTENTION**, il convient de s'interrompre 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 s'y rapportant ne sont pas exécutés correctement, il existe un risque de blessure voire de mort. 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 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 ligne 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 à bouton poussoir bi-stable.


Position Arrêt d'un interrupteur à bouton poussoir bi-stable.


Attention, danger d'électrocution.


Attention, surface chaude.


Attention, consultez la documentation fournie.


Ne pas jeter avec les déchets ménagers.

Dispositions légales

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Table des matières

Système d’alimentation en courant continu Keysight N8700 : présentation succincte

Le système d’alimentation en courant continu Keysight Technologies série N8700 est composé d’alimentations à usage universel avec une grande diversité de courants et de tensions de sortie. Il existe des modèles 3,3 kW et 5 kW.

Ces alimentations ont un facteur de puissance corrigé et des options flexibles de tension d’entrée CA. 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.
- Lecture précise de la tension et du courant.
- Coupure déclenchée de manière externe par front indépendant et activation/désactivation déclenchée de manière externe par niveau de signal.
- Fonctionnement en mode parallèle maître/esclave avec partage actif du courant.
- Détection à distance pour compenser la chute de tension dans les conducteurs de charge.
- Programmation et surveillance par sorties analogiques.

Caractéristiques système

- Interface GPIB/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.
- Correction active du facteur de puissance.
- Contrôle de la vitesse du ventilateur pour réduire le bruit et allonger sa durée de vie.

Fonctions programmables

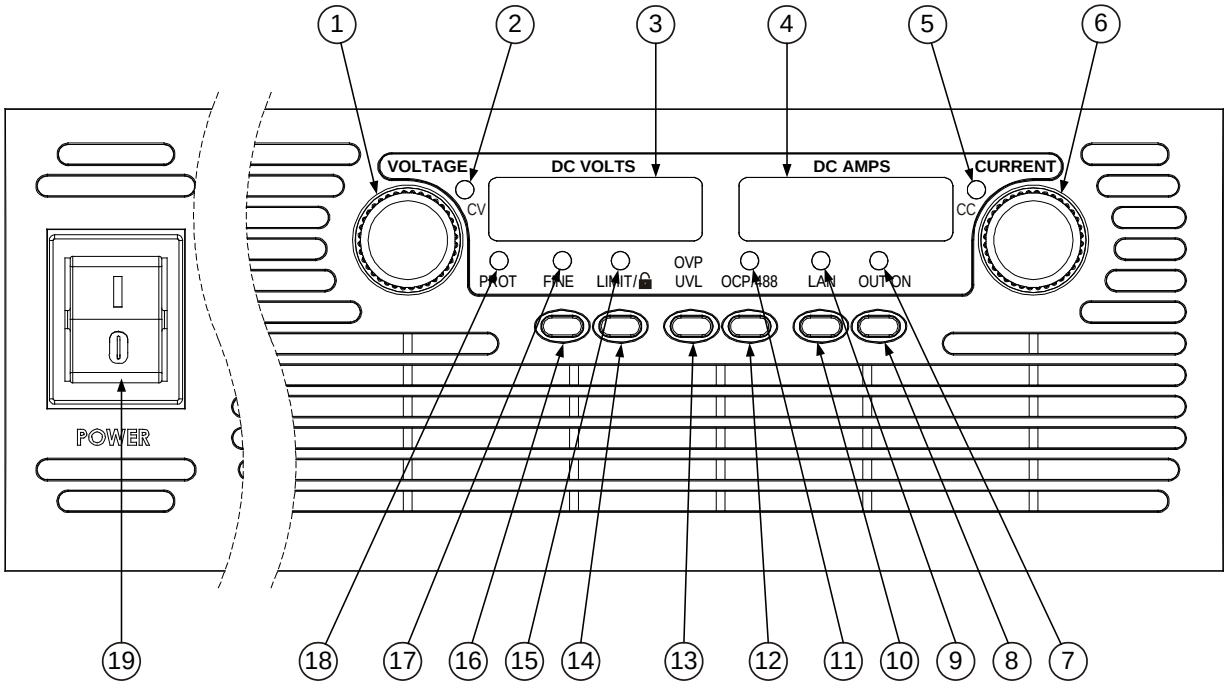
- Réglage de la tension et du courant de sortie.
- Mesure de la tension et du courant de sortie.
- Réglage du déclenchement de la tension et du courant de sortie.
- Commande d'activation/de désactivation de la sortie.
- Réglage de la protection contre les surintensités.
- Réglage et lecture de la protection contre les surtensions.
- Réglage et lecture de la limite de sous-tension.
- Mode de démarrage (selon le dernier réglage ou en réinitialisation).
- Réglage et lecture de registres d'état.
- Déclenchement par bus.
- Etalonnage.

Tension et courant selon les modèles

Modèles 3,3 kW			Modèles 5 kW		
Modèle	Plage de tension	Plage de courant	Modèle	Plage de tension	Plage de courant
N8731A	0 – 8 V	0 – 400 A	N8754A	0 – 20 V	0 – 250 A
N8732A	0 – 10 V	0 – 330 A	N8755A	0 – 30 V	0 – 170 A
N8733A	0 – 15 V	0 – 220 A	N8756A	0 – 40 V	0 – 125 A
N8734A	0 – 20 V	0 – 165 A	N8757A	0 – 60 V	0 – 85 A
N8735A	0 – 30 V	0 – 110 A	N8758A	0 – 80 V	0 – 65 A
N8736A	0 – 40 V	0 – 85 A	N8759A	0 – 100 V	0 – 50 A
N8737A	0 – 60 V	0 – 55 A	N8760A	0 – 150 V	0 – 34 A
N8738A	0 – 80 V	0 – 42 A	N8761A	0 – 300 V	0 – 17 A
N8739A	0 – 100 V	0 – 33 A	N8762A	0 – 600 V	0 – 8,5 A
N8740A	0 – 150 V	0 – 22 A			
N8741A	0 – 300 V	0 – 11 A			
N8742A	0 – 600 V	0 – 5,5 A			

Remarque 1 : tension de sortie minimum ≤ 0,2 % de la tension de sortie nominale.
Remarque 2 : courant de sortie minimum ≤ 0,4 % du courant de sortie nominal.

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. Appuyez sur le bouton FINE pour sélectionner la résolution fine.

Adresse GPIB : sélectionne l'adresse GPIB en maintenant le bouton OCP/488 enfoncé.

2 – Voyant VOLTAGE (tension)

Indique que l'unité est en mode tension constante – la tension de sortie est maintenue constante.

3 – Ecran DC VOLTS (tension continue)

Affiche normalement la tension mesurée aux bornes de détection.
- Indique la tension programmée lorsque le bouton LIMIT est enclenché.
- Indique la protection contre les surtensions ou la limite de sous-tension lorsque le bouton OVP/UVL est enclenché.
- Indique l'adresse GPIB si l'on maintient le bouton OCP/488 enfoncé.
- Indique l'adresse IP et l'adresse Ethernet si l'on maintient le bouton LAN enfoncé.

4 – Ecran DC AMPS (courant continu)

Affiche normalement le courant mesuré aux bornes de sortie.
- Indique le courant programmé lorsque le bouton LIMIT est enclenché.
- Indique l'adresse IP et l'adresse Ethernet en maintenant le bouton LAN enfoncé.

5 – Voyant CURRENT (courant)

Indique que l'unité est en mode courant constant – le courant de sortie est maintenu constant.

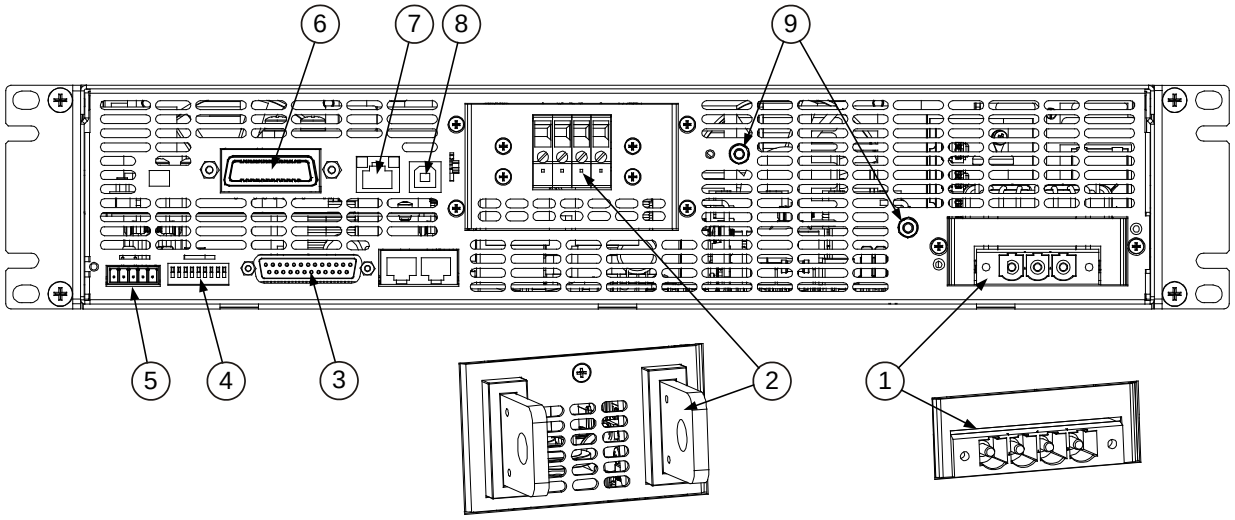
6 – Bouton CURRENT (courant)

Règle le courant de sortie. Appuyez sur le bouton FINE pour sélectionner la résolution fine.

7 – Voyant OUT ON (activation de la sortie)	Indique si la sortie est ou non activée.
8 – Bouton OUT ON (activation de la sortie)	Fonction de sortie : appuyez sur le bouton OUT ON pour activer ou désactiver la sortie. Appuyez sur le bouton OUT ON pour réinitialiser l'appareil et réactiver la sortie suite à un événement OVP (protection contre les surtensions) ou OCP (protection contre les surintensités). Fonction de démarrage : maintenez le bouton OUT ON enfoncé pour passer du mode Safe-Start au mode Auto-Restart. L'écran affiche SAF ou AU7. Si l'on relâche le bouton OUT ON, le mode correspondant à celui affiché alors est sélectionné.
9 – Voyant LAN	Indique que le LAN est configuré et fonctionne normalement. Si vous réglez une nouvelle unité sur la page d'accueil Web du N8700, le voyant LAN clignote pour identifier cette unité.
10 – Bouton LAN	Affichage d'adresse : appuyez sur le bouton LAN pour visualiser l'adresse IP et l'adresse Ethernet. L'écran affiche d'abord les quatre segments de l'adresse IP, puis les six segments de l'adresse Ethernet (EA). Appuyez sur une touche quelconque pour éteindre l'affichage de l'adresse. Réinitialisation d'adresse : maintenez le bouton LAN enfoncé pendant trois secondes. Appuyez à nouveau sur le bouton LAN alors que le message « LAn rES » est affiché pour réinitialiser la configuration LAN aux réglages usine (voir chapitre 4 pour les réglages). L'affichage repasse en mode normal et la configuration n'est pas modifiée tant que le bouton LAN n'est pas activé à nouveau.
11 – Voyant OCP/488	Indique si la protection contre les surintensités est activée ou non.
12 – Bouton OCP/488	Activation de l'OCP : appuyez sur le bouton OCP/488 pour activer la protection contre les surintensités. Appuyez à nouveau sur le bouton OCP/488 pour désactiver cette protection. Réinitialisation OCP : appuyez sur le bouton OUT ON pour activer la sortie et réarmer la protection contre les surintensités suite à un événement de protection contre les surintensités. Adresse GPIB : maintenez le bouton OCP/488 enfoncé pendant trois secondes pour régler l'adresse GPIB à l'aide du bouton Voltage.
13 – Bouton OVP/UVL (protection contre les surtensions/limite de sous-tension)	Fonction OVP : appuyez une fois sur le bouton OVP/UVL pour régler le niveau de protection contre les surtensions en utilisant le bouton VOLTAGE (l'écran indique OUP). Vous ne pouvez pas régler la protection contre les surtensions à un niveau inférieur à environ 5 % au-dessus du réglage actuel de la tension de sortie. Fonction UVL : appuyez deux fois sur OVP/UVL pour régler la limite de programmation de sous-tension en utilisant le bouton VOLTAGE (l'écran indique UUL). Vous ne pouvez pas régler la protection contre les sous-tensions à un niveau supérieur à environ 5 % au-dessous du réglage actuel de la tension de sortie.

14 – Bouton LIMIT (limite)	Fonction de limite : appuyez sur le bouton LIMIT pour afficher la limite de la tension et du courant de sortie. Les réglages s'affichent à l'écran pendant cinq secondes, puis l'écran affiche à nouveau le réglage actuel de tension et de courant de sortie. Fonction de verrouillage : maintenez le bouton LIMIT enfoncé pour passer du verrouillage au déverrouillage. L'écran affiche LFP (verrouillage de la face avant) ou UFP (déverrouillage de la face avant). Si vous relâchez le bouton LIMIT, le mode correspondant à celui affiché est sélectionné. L'écran affiche rLFP pour signaler un verrouillage de la face avant par une commande de programmation à distance.
15 – Voyant LIMIT (limite)	Indique que le bouton LIMIT est enfoncé.
16 – Bouton FINE (réglage fin)	Sélectionne le mode de réglage fin ou grossier pour les boutons de tension et intensité. Appuyez sur le bouton FINE (fin) pour définir le mode fin ; appuyez à nouveau pour repasser en mode Coarse (grossier). - Mode fin : le bouton fonctionne avec une résolution élevée. - Mode grossier : le bouton fonctionne avec une basse résolution (environ six tours).
17 – Voyant FINE (réglage fin)	Indique que l'appareil est en mode de réglage haute résolution (mode fin).
18 – Voyant PROT (protection)	Clignote en cas d'anomalie. La détection d'une anomalie OVP, OCP, OTP, Enable et AC provoque le clignotement du voyant PROT (protection). Ce voyant peut clignoter et l'écran peut afficher AC pendant quelques secondes après l'arrêt de l'alimentation en raison de l'énergie résiduelle présente à l'intérieur de l'appareil.
19 – Interrupteur POWER (mise sous tension)	Allume et éteint l'appareil.

Face arrière : présentation succincte

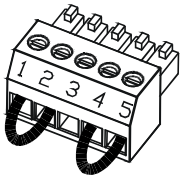


1 – Connecteur d'entrée secteur	Embase avec connecteur correspondant pour les modèles de puissance de sortie 3,3 kW et 5 kW. Une prise 3 conducteurs est prévue pour le V CA monophasé. Une prise 4 conducteurs est prévue pour le V CA triphasé.
2 – Connecteur de sortie CC	Connecteur à serrage sur les modèles 150 V, 300 V et 600 V ; barres omnibus sur les modèles 8 V à 100 V.
3 – Connecteur de programmation analogique	Connecteur pour l'interface analogique. Il inclut les signaux de programmation et de surveillance de la limite 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.)
4 – Commutateur de configuration SW1	Commutateur à neuf positions pour sélectionner les modes de programmation à distance 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.)
5 – Connecteur de détection à distance	Connecteur pour réaliser des connexions de détection à distance afin de réguler la tension aux bornes de la charge en compensant la chute de tension dans les fils. (Reportez-vous à la page suivante pour plus de détails.)
6 – Connecteur GPIB	Connecteur pour branchement à une interface GPIB. (Voir chapitre 4 pour la configuration.)
7 – Connecteur LAN	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. (Voir chapitre 4 pour la configuration.)
8 – Connecteur USB	Connecteur pour branchement à une interface USB. (Voir chapitre 4 pour la configuration.)
9 – Vis et écrou de masse	Vis M4x8 avec écrou pour réaliser des branchements de masse au châssis.

AVERTISSEMENT RISQUE D'ELECTROCUTION Le cordon d'alimentation CA assure une mise à la terre du châssis par l'intermédiaire du conducteur de terre. Assurez-vous que la source d'alimentation est à trois conducteurs pour les modèles monophasés et à quatre conducteurs pour les modèles triphasés, le conducteur de terre (vert/jaune) étant relié à la terre.

Connecteur de détection J2

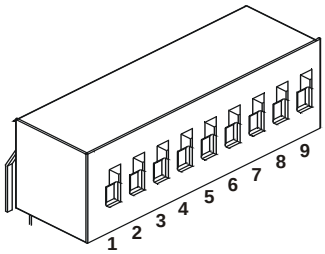
1 – Détection à distance (+)
2 – Détection locale (+)
3 – Non utilisé
4 – Détection locale (-)
5 – Détection à distance (-)



Type de prise :	MC 1,5/5-ST-3,81, Phoenix
Section des fils :	AWG 28 à AWG 16
Longueur dénudée :	7 mm
Couple :	0,22 – 0,25 Nm

La figure illustre la configuration d'usine.

Commutateur de configuration SW1

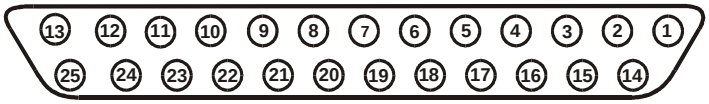


En configuration d'usine, tous les commutateurs sont en position basse.

1 – Tension de sortie, programmation par tension	Bas : la tension de sortie est programmée par la face avant. Haut : la tension de sortie est programmée par le signal de tension externe.
2 – Courant de sortie, programmation par tension	Bas : le courant de sortie est programmé par la face avant. Haut : le courant de sortie est programmé par le signal de tension externe.
3 – Plage de programmation (tension/résistance)	Bas : la plage de programmation à distance est : 0 – 5 V/0 – 5 kΩ. Haut : la plage de programmation à distance est : 0 – 10 V/0 – 10 kΩ.
4 – Plage de surveillance tension et courant	Bas : la plage de surveillance à distance est : 0 – 5 V. Haut : la plage de surveillance à distance est : 0 – 10 V.

5 – Polarité logique de coupure	Bas : SORTIE DESACTIVEE = niveau bas (0 – 0,6 V) ou court-circuit ; SORTIE ACTIVEE = niveau haut (2 – 15 V) ou circuit ouvert. Haut : SORTIE DESACTIVEE = niveau haut (2 – 15 V) ou circuit ouvert ; SORTIE ACTIVEE = niveau bas (0 – 0,6 V) ou court-circuit.
6 – Non utilisé	
7 – Tension de sortie, programmation par une résistance	Bas : la tension de sortie est programmée par la face avant. Haut : la tension de sortie est programmée par la résistance externe.
8 – Courant de sortie, programmation par une résistance	Bas : le courant de sortie est programmé par la face avant. Haut : le courant de sortie est programmé par la résistance externe.
9 – Contrôle d'activation/ désactivation	Bas : les broches Activation+/Activation- de J1 ne sont pas actives. Haut : les broches Activation+/Activation- de J1 sont actives.

Connecteur de programmation analogique J1



Prise adaptable :	Numéro de référence AMP 745211-2
Section des fils :	AWG 26 à AWG 22
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.

Broche 1 :	Activation Entrée	Connexion de la broche 1 à la broche 14 pour activer la sortie (déconnexion pour désactiver la sortie).
Broches 2, 3 :	Commun du châssis	Retour du signal pour les broches 15 et 16 (connectées au châssis).
Broches 4 – 7 :	Non utilisées	Pas de connexion.
Broche 8 :	Programmation locale/analogique	Entrée pour sélection de la programmation de la sortie depuis la face avant ou analogique.
Broche 9 :	Programmation de la tension	Entrée pour programmation de la tension de sortie par une tension ou une résistance.
Broche 10 :	Programmation du courant	Entrée pour programmation du courant de sortie par une tension ou une résistance.
Broche 11 :	Surveillance de la tension	Sortie pour surveillance de la tension de sortie.
Broche 12 :	Commun	Retour du signal pour les broches 8, 11, 13 et 24 (référencé par rapport à –S).

Broche 13 :	Tension constante/ courant constant	Sortie pour indication du mode tension constante/ courant constant.
Broche 14 :	Activation Sortie	Connexion de la broche 14 à la broche 1 pour activer la sortie (déconnexion pour désactiver la sortie).
Broche 15 :	Coupure	Entrée de la commande de coupure de la sortie (référencé par rapport au commun du châssis).
Broche 16 :	Témoin de bon fonctionnement de l'alimentation	Sortie pour indiquer l'état de l'alimentation (référencé par rapport au commun du châssis).
Broches 17 – 20 :	Non utilisées	Pas de connexion.
Broche 21 :	Etat de programmation locale/analogique	Sortie pour indication du mode de programmation locale ou analogique.
Broche 22 :	Retour prog. tension	Retour du signal pour la broche 9 (connectée en interne à la broche 12).
Broche 23 :	Retour prog. courant	Retour du signal pour la broche 10 (référencé par rapport à la broche 12).
Broche 24 :	Surveillance du courant	Sortie pour surveillance du courant de sortie.
Broche 25 :	Parallèle	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. 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.**

ATTENTION N’obstruez pas l’entrée de ventilation à l’avant de l’appareil ou la sortie à l’arrière.

L’appareil est réservé à un usage en intérieur, dans des locaux 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. Lors de l’installation de l’appareil, un espace d’au moins 10 cm doit être ménagé à l’avant et à l’arrière de l’appareil afin d’assurer une bonne ventilation.

Installation en baie

Les alimentations Keysight N8700 peuvent être installées en baie et panneau ou en armoire standard de 19 pouces. Pour installer l’alimentation en 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 standard de 19 pouces, utilisez le kit de glissières de montage en baie Keysight N5740A. Deux vis #10 32 x 9,6 mm (max.) sont nécessaires de chaque côté. **Pour éviter tout dommage interne, n’utilisez que des vis de la longueur indiquée.**

Nettoyage

AVERTISSEMENT RISQUE D'ELECTROCUTION Pour éviter tout risque d'électrocution, 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 assure une mise à la terre du châssis par l'intermédiaire du conducteur de terre. Vérifiez que le conducteur de terre du cordon d'alimentation est relié à la terre au niveau de la source et du connecteur d'entrée CA de l'appareil.

RISQUE D'INCENDIE N'utilisez que le cordon d'alimentation secteur fourni avec votre appareil. L'utilisation d'autres types de cordon d'alimentation secteur peut provoquer une surchauffe de celui-ci, avec un risque d'incendie.

AVERTISSEMENT BRANCHEMENT AU SECTEUR L'alimentation doit être raccordée au secteur par un dispositif de protection, tel qu'un disjoncteur ou un fusible présentant les caractéristiques nominales suivantes :
Modèles monophasés : 30 A maximum par phase
Modèles triphasés : 20 A maximum par phase

ATTENTION Le branchement d'une alimentation 3,3 kW ou 5 kW au secteur doit être réalisé par un électricien qualifié conformément aux normes électriques locales en vigueur.

L'interrupteur de marche/arrêt n'est pas un dispositif permettant une déconnexion du secteur. Il ne déconnecte pas entièrement tous les circuits du secteur. L'installation finale doit comporter un dispositif de déconnexion, à savoir un disjoncteur pour les configurations permanentes ou multi-phase.

Ce dispositif de déconnexion doit être conforme aux exigences selon UL/CSA/EN 61010-1. Il doit se trouver à proximité immédiate de l'équipement, être facilement accessible et être identifié comme dispositif de déconnexion de l'équipement. Le dispositif de déconnexion doit présenter les caractéristiques nominales d'entrée spécifiées sur l'étiquette INPUT RATING apposée sur le capot supérieur de chaque appareil.

Chaque appareil est livré avec un des câbles d'alimentation sans connecteur suivants. Si nécessaire, connectez une fiche de type appropriée à l'extrémité du câble d'alimentation.

Option du câble/ référence	Description	Caractéristiques nominales	Section des fils	Longueur	Homologations
OPT 831, p/n 8121-1949	3,3 kW monophasé	300 V, 25 A, 60 °C	3 x 10 AWG[Rem1,3]	2,5 m	UL/CSA
OPT 832, p/n 8121-1331	3,3 kW monophasé	250 V, 32 A, 60 °C	3 x 4 mm^2 [Rem1]	2,5 m	Harmonisé
OPT 861, p/n 8121-1946	3,3 kW/5 kW triphasé (190–240 V CA, nominal)	300 V, 25 A, 90 °C	4 x 10 AWG [Rem2,3]	2,5 m	UL/CSA
OPT 862, p/n 8121-1948	3,3 kW/5 kW triphasé (380–415 V CA, nominal)	450 V, 20 A, 70 °C	4 x 2,5 mm^2 [Rem2]	2,5 m	Harmonisé

Remarque 1 : 2 fils plus un conducteur de terre de sécurité vert/jaune
Remarque 2 : 3 fils plus un conducteur de terre de sécurité vert/jaune
Remarque 3 : 10 AWG correspond à 4 mm^2

Connexions d'entrée des appareils 3,3 kW et 5 kW

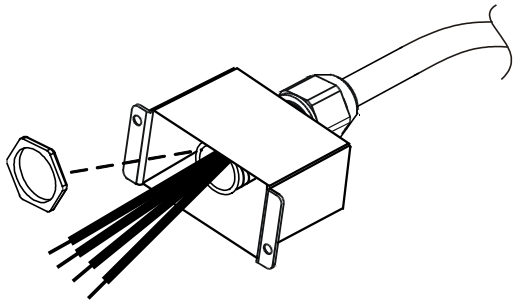
Le connecteur d'entrée CA se trouve sur la face arrière. Il s'agit d'un connecteur à serrage 3 bornes pour les appareils monophasés 3,3 kW ou d'un connecteur à serrage 4 bornes pour les appareils triphasés 3,3 kW et 5 kW. Les caractéristiques nominales de tension et courant d'entrée sont les suivantes :

Appareil	Entrée CA, nominal	Courant d'entrée @ 100 % de charge	Fréquence
3,3 kW, monophasé	190 – 240 V CA	23 – 24 A max.	50/60 Hz
3,3 kW, triphasé	190 – 240 V CA	13,6 – 14,5 A max.	50/60 Hz
	380 – 415 V CA	6,8 – 7,2 A max.	50/60 Hz
5 kW, triphasé	190 – 240 V CA	21 – 22 A max.	50/60 Hz
	380 – 415 V CA	10,5 – 12 A max.	50/60 Hz

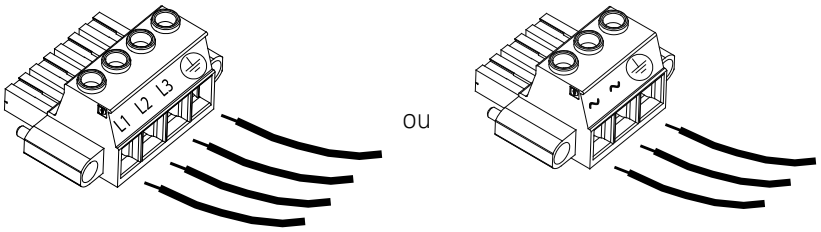
REMARQUE Vous ne pouvez pas modifier la tension secteur nominale de l'appareil. Si la tension secteur nominale ne correspond pas à la source de courant alternatif, l'appareil doit être retourné à l'usine à des fins de modification.

Branchez le câble au connecteur d'entrée secteur comme suit :

1. Retirez l'isolant externe du câble CA sur environ 10 cm. Coupez les fils de sorte que le fil de terre (vert/jaune) mesure 10 mm de plus que les autres. Dénudez l'extrémité de chaque fil sur 10 mm.
2. Dévissez l'embase du serre-câble de l'écrou à compression. Placez l'écrou de blocage dans le capot d'entrée secteur en plaçant le côté plat de l'écrou contre le capot. Insérer la base dans l'ouverture du capot d'entrée secteur. Vissez l'embase sur l'écrou de blocage depuis l'extérieur. Couple de serrage : 23 Nm.
3. Faites glisser l'écrou à compression sur le câble CA. 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 une clé sur l'embase pour l'empêcher de tourner. Serrez l'écrou à compression sur l'embase tout en maintenant le câble en place. Couple de serrage : 19 – 22 Nm. Reportez-vous à la figure suivante.

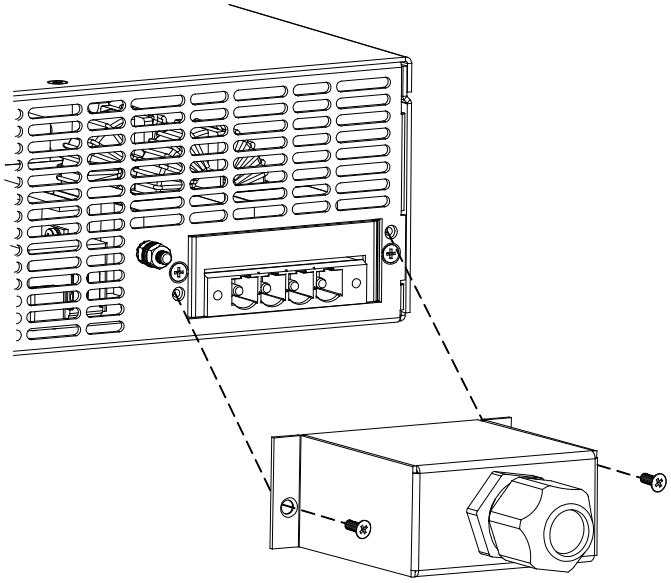


4 Acheminez soigneusement les fils jusqu'aux bornes du connecteur d'entrée. Pour brancher les fils, desserrez la vis de la borne, insérez les fils dénudés dans la borne puis resserrez bien la vis, comme indiqué sur la figure suivante. Vérifiez que le conducteur de terre vert/jaune est bien connecté à la borne de terre du connecteur. Enfichez le connecteur sur l'embase de la face arrière et fixez-le à l'aide des vis latérales. Couple de serrage des vis : 1,2 – 1,5 Nm.



Type de prise :	PC 6/4-STF-10,16 ou PC 6/3-STF-10,16, Phoenix
Section des fils :	AWG 18 à AWG 8
Longueur dénudée :	12 mm
Couple :	1,2 – 1,5 Nm

5 Placez correctement les fils à l'intérieur du capot pour éviter tout pincement lorsque vous glissez le capot vers la face arrière pour le fixer. Fixez le capot à l'alimentation à l'aide des vis à tête fraisée M3 x 8 mm fournies. Couple de serrage des vis : 0,54 Nm. Reportez-vous à la figure suivante.



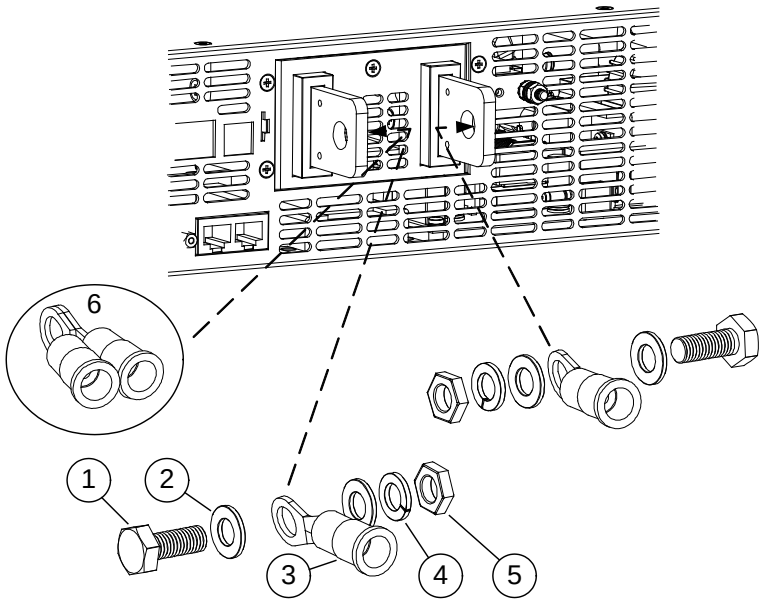
Branchement de la charge (modèles 8 V à 100 V)

AVERTISSEMENT RISQUE D'ELECTROCUTION Coupez 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 accidentel 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 supérieure ou égale à celle nécessaire pour la tension de sortie maximale de l'alimentation.

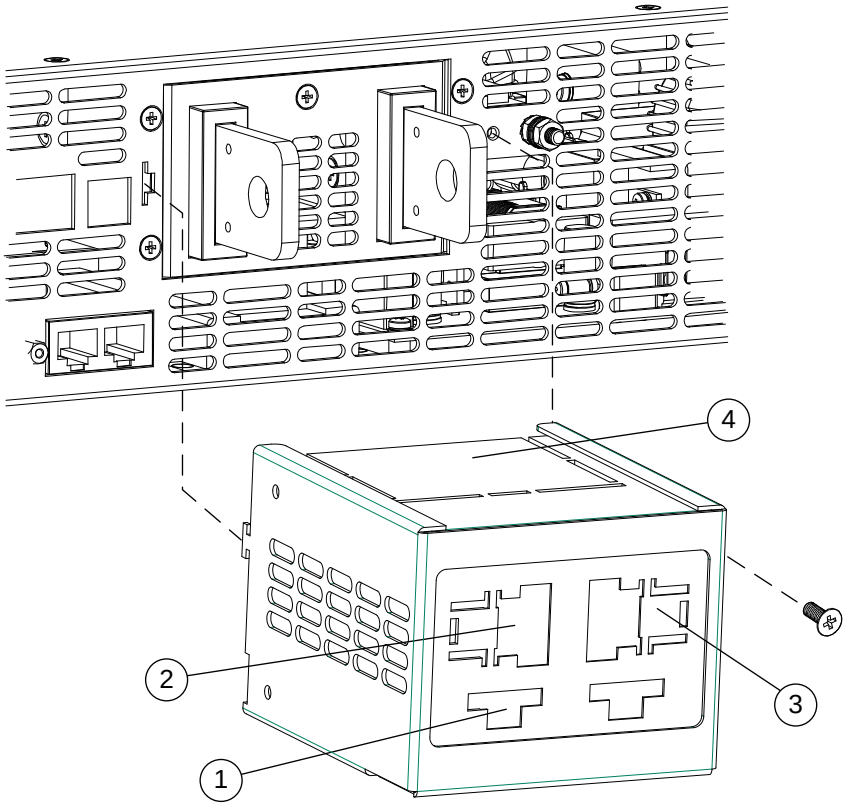
ATTENTION Vérifiez que le matériel de fixation ne court-circuite pas les bornes de sortie. Les câbles de connexion lourds doivent être munis de dispositifs réducteurs de contrainte pour éviter de desserrer les connexions ou de tordre les barres omnibus.

1 Comme le montre la figure suivante, tous les fils de charge doivent être munis de cosses solidement fixées aux bornes. N'utilisez pas de fils nus pour relier la charge à l'alimentation. Reliez les bornes des fils à *l'intérieur* des barres omnibus pour garantir un espace suffisant pour installer le blindage.



1 – Vis
2 – Rondelle plate
3 – Cosse
4 – Rondelle frein parallèle
5 – Ecrou
6 – Cosses en

2 Montez le blindage une fois que vous avez terminé le branchement des fils de charge. Si nécessaire, retirez les découpes appropriées pour les fils de plus grande section, tel qu'indiqué sur la figure suivante. Fixez le blindage en utilisant la patte du côté gauche et la vis à tête fraisée M3 x 8 mm sur le côté droite. Couple de serrage des vis : 0,54 – 0,6 Nm.



1 – Ouverture pour fils de section à partir de AWG 4 – 10.
2 – Ouverture pour fils de section à partir de AWG 2 – 1/0.
La petite découpe est retirée.
3 – Retirez cette découpe pour les fils de section AWG 2/0 – 3/0.
4 – Retirez cette découpe pour l'installation du rail de bus.

Branchement de la charge (modèles 150 V, 300 V et 600 V)

AVERTISSEMENT RISQUE D'ELECTROCUTION Coupez 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.

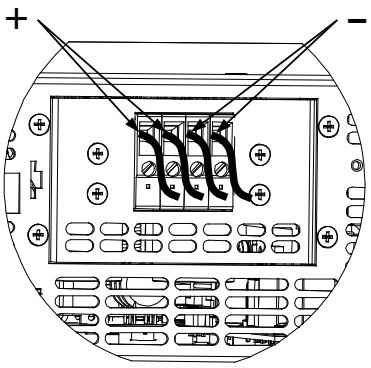
Afin de protéger le personnel de tout contact accidentel avec des tensions dangereuses, vérifiez que la charge et ses connexions ne présentent pas de parties sous tension accessibles. Vérifiez que l'isolation des fils de charge est supérieure ou égale à celle nécessaire pour la tension de sortie maximale de l'alimentation.

Les modèles 150 V, 300 V et 600 V sont équipés d'un connecteur de sortie à serrage 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 :

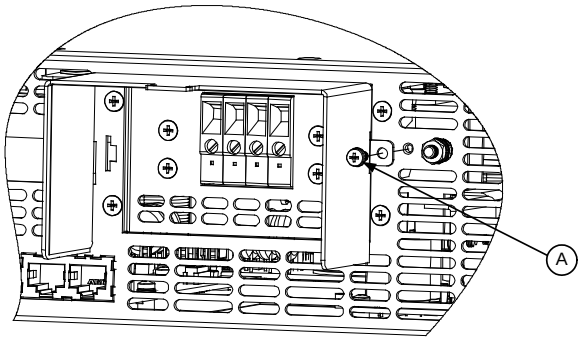
Section des fils :	AWG 18 à AWG 10
Longueur dénudée :	10 mm
Couple :	0,5 – 0,6 Nm.

Branchez les fils de charge au connecteur de sortie à serrage de l'alimentation, comme suit :

1. Dénudez les fils sur approximativement 10 mm.
2. Desserrez les vis des bornes du connecteur et insérez les fils dénudés dans les bornes. Serrez à fond les vis des bornes.



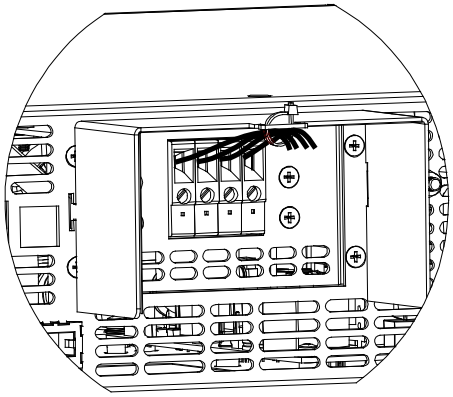
3 Desserrez et retirez la vis du châssis marquée A et mettez-la de côté.



4 Faites glisser la patte du côté gauche du blindage de protection dans la fente du châssis et fixez-la. Insérez la vis du blindage côté droite (précédemment retirée) pour fixer le blindage au châssis. Couple de serrage des vis : 0,54 – 0,6 Nm.

5 Acheminez les fils de charge vers la patte située sur la partie supérieure du blindage. Vérifiez que la longueur des fils est suffisante dans le blindage pour soulager la traction.

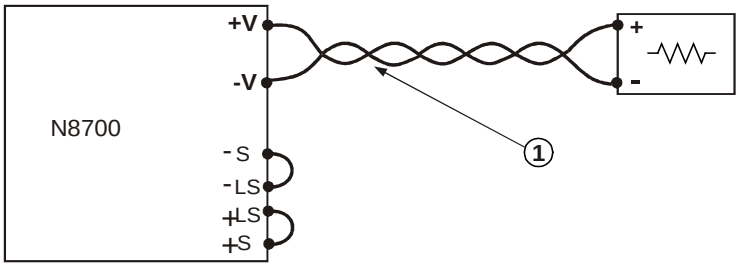
6 Fixez les fils de charge à la patte de blindage à encoche en utilisant une attache-câbles ou équivalent, tel qu'indiqué sur la figure suivante.



Détection de la tension de sortie

Détection locale

L'alimentation est livrée avec le connecteur de détection J2 de face arrière câblé pour la détection 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 détection locale n'est recommandée que si le courant de charge est faible ou la régulation par rapport à la charge peu critique.

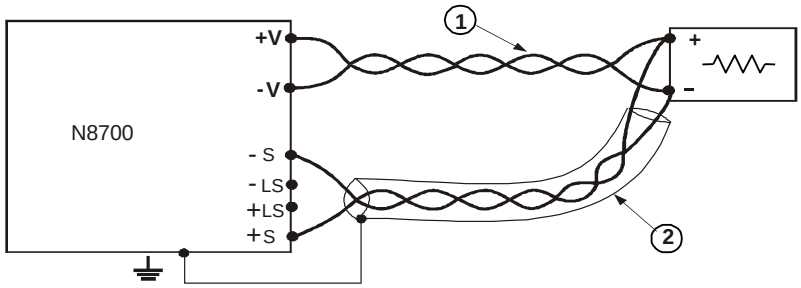


1 – Lignes de charge = paire torsadée ; longueur la plus courte possible

Détection à distance

Utilisez la détection à distance si la régulation par rapport à la 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 la charge.

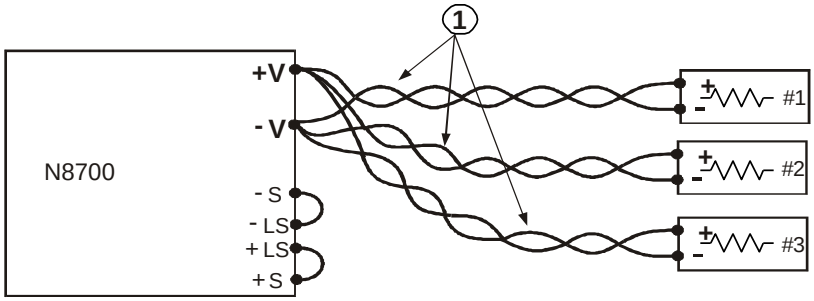


1 – Lignes de charge = paire torsadée ; longueur la plus courte possible
2 – Lignes de détection = paire torsadée ou fils blindés

Considérations relatives à la charge

Charges multiples

La figure suivante représente plusieurs charges connectées à une seule alimentation. Chaque charge doit être connectée aux bornes de 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 la captation et le rayonnement de bruit.

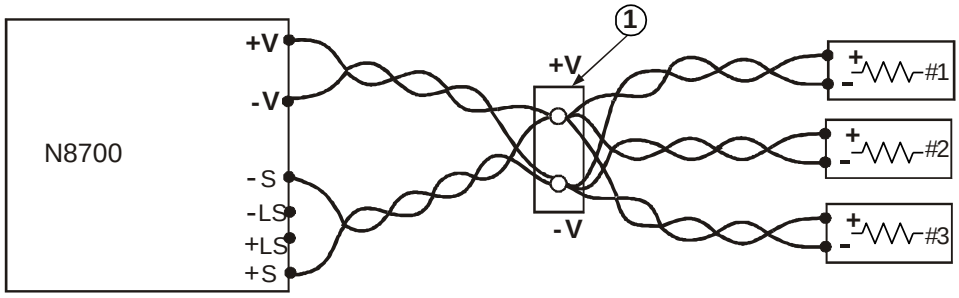


1 – Lignes de charge = paire torsadée ; longueur la plus courte possible

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 par une paire de fils torsadés ou blindés. Branchez séparément chaque charge aux bornes de distribution. La détection 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 aux valeurs nominales maximum de la tension et du 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 près 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 ± 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 ± 600 V CC au-dessus ou en-dessous de la masse du châssis.

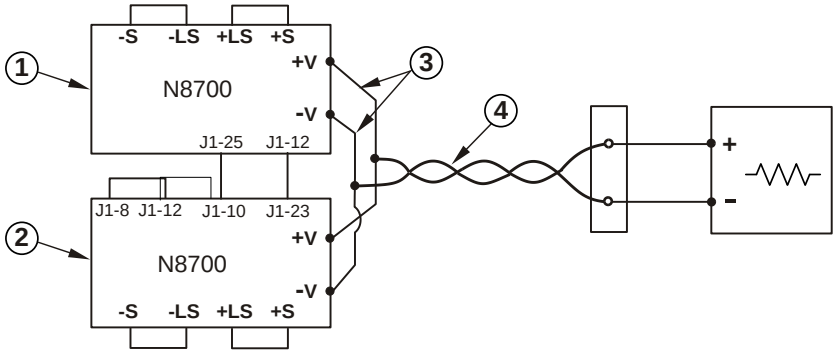
Pour les modèles dont la tension nominale de sortie est supérieure à 60 V CC, aucun point du pôle négatif ne doit être à plus de ± 400 V CC au-dessus ou en-dessous de la masse du châssis.

Connexions en parallèle

ATTENTION Seules des alimentations dont les valeurs nominales de tension et de courant sont équivalentes peuvent être connectées en parallèle.

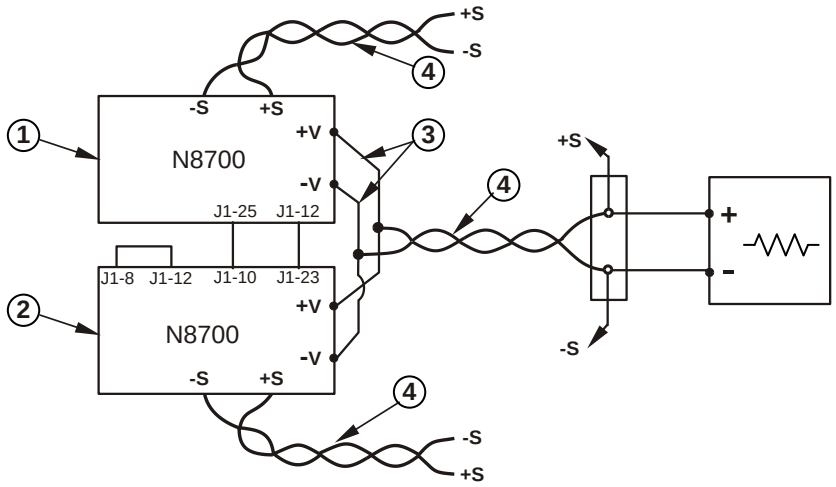
Jusqu'à quatre alimentations de même valeur nominale de tension et de courant peuvent être connectées en parallèle et fournir jusqu'à quatre fois le courant disponible sur une seule alimentation. Les figures suivantes représentent deux alimentations. Toutefois, la même méthode de connexion est possible 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 connexion des alimentations esclaves à l'ordinateur ne sert qu'à la lecture de la tension, du courant et de leur état.



Détection locale

1 – Alimentation maître
2 – Alimentation esclave
3 – Aussi court que possible
4 – Paire torsadée



Détection 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 détection locale ou à distance comme dans les figures précédentes. Réglez la tension de sortie de l’alimentation maître à la valeur désirée. Programmez la limite de courant à la valeur limite totale du courant désirée 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 tension de sortie 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 J1de l'alimentation esclave à la broche 25 (parallèle) du connecteur J1 de l'alimentation maître. Reliez la broche 23 (retour prog. courant) du connecteur J1de l'alimentation esclave à la broche 12 (commun) du connecteur J1 de l'alimentation maître. Reliez également ensemble les broches 8 et 12 de J1. La tension de sortie des alimentations esclaves doit être programmée en étant 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 désirée 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 peut n'être utilisée qu'avec l'alimentation maître. Si celle-ci se coupe, elle programme la tension de sortie des alimentations esclaves 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 ± 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 ± 600 V CC au-dessus ou en-dessous de la masse du châssis.

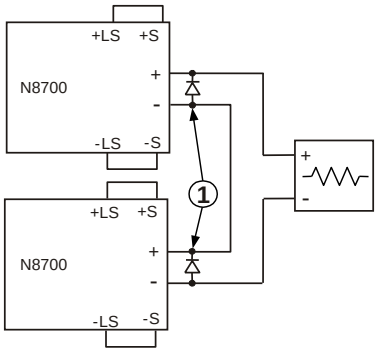
Pour les modèles dont la tension nominale de sortie est supérieure à 60 V CC, aucun point du pôle négatif ne doit être à plus de ± 400 V CC au-dessus ou en-dessous de la masse du châssis.

ATTENTION Seules des alimentations dont les valeurs nominales de tension et de courant sont équivalentes peuvent être connectées en série.

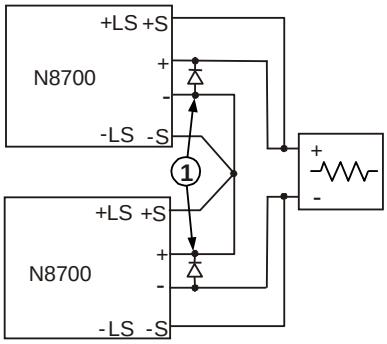
Deux alimentations de même valeur nominale de tension et de courant peuvent être connectées en série pour doubler la tension de sortie disponible. Comme le courant est identique dans chaque élément d'un circuit en série, les sorties connectées en série DOIVENT avoir des valeurs nominales de courant équivalentes.

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 sortie de l'alimentation.

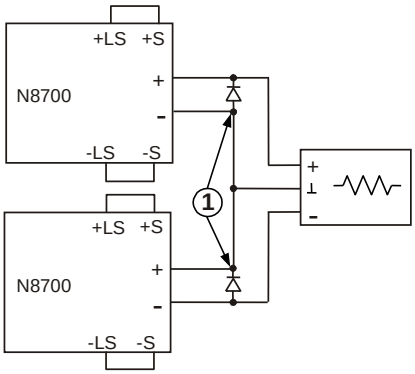
Les figures suivantes illustrent des connexions en série avec détection locale et à distance, et un schéma d'alimentations connectées en série configurées pour obtenir une tension positive et une tension négative.



Détection locale



Détection à distance



Tension positive et tension négative

1 – L'utilisateur doit fournir les diodes.

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 dans la charge varie selon la valeur requise par la charge. 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 le bouton VOLTAGE. 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 de la tension minimale peut aussi être limité par les réglages de protection contre les surtensions et de limite de sous-tension.

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 tension constante, appuyez sur le bouton LIMIT puis tournez le bouton CURRENT. L'écran DC AMPS affiche le courant programmé pendant 5 secondes puis affiche 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 la 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 de courant réglée, 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 moins de 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. La broche 12 de J1 est connectée en interne à la broche –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 supplémentaires, 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 (UVL) 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 supplémentaires, 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 de la face avant enfoncé pour passer du verrouillage (LFP) au déverrouillage (UFP). Si vous relâchez le bouton LIMIT, le mode correspondant à celui affiché alors est sélectionné.

En mode déverrouillé, les commandes de la face avant sont activées pour programmer et surveiller les paramètres de l'alimentation.

En mode verrouillé, les boutons VOLTAGE et CURRENT, le bouton OCP/488 et le bouton 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

Des 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 par front. 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 par photocoupleur de la sortie de l'alimentation. 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 de coupure 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 type 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 de la sortie.

Interrupteur 5 de SW1	Niveau du signal SO (coupure)	Sortie	Affichage
Position basse (défaut)	2 – 15 V ou en circuit ouvert	Activée	Tension/courant
	0 – 0,4 V ou en court-circuit	Désactivée	SO
Position haute	2 – 15 V ou en circuit ouvert	Désactivée	SO
	0 – 0,4 V ou en court-circuit	Activée	Tension/courant

Bornes d'activation/désactivation

ATTENTION Afin d'éviter tout dommage éventuel à l'alimentation, ne connectez pas les bornes Enable + et Enable - aux bornes de sortie positive ou négative.

Ces bornes sont disponibles sur le connecteur J1 pour activer/ désactiver la sortie de l'alimentation. Cette fonction est déclenchable par niveau : il suffit de brancher un commutateur ou un relais entre les broches 1 et 14 de J1. Cette fonction 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. En absence 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. Les anomalies suivantes font passer le signal au niveau bas :

- Protection contre les surtensions
- Protection contre les surintensités
- Protection contre les températures excessives
- Panne d'alimentation secteur
- Signal d'activation/désactivation vrai
- Signal de coupure vrai
- Panne d'interface
- Sortie désactivée

Démarrage de sécurité et redémarrage automatique

L'alimentation peut être programmée pour qu'elle retrouve à sa mise sous tension les derniers réglages opérationnels (Auto-Restart) ou les réglages réinitialisés (Safe-Start). Maintenez le bouton OUT ON enfoncé pour passer d'un mode à l'autre. L'écran affiche SAF ou AUT, en alternance toutes les 3 secondes. Si vous relâchez le bouton OUT ON, le mode correspondant à celui affiché alors 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.

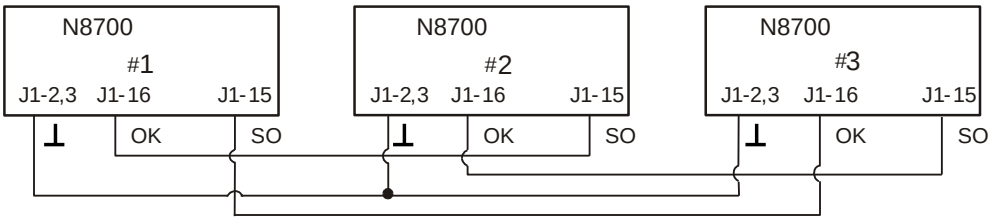
En redémarrage automatique, l'alimentation restaure les paramètres opérationnels sauvegardés lors de son dernier arrêt (consultez la liste suivante). La sortie est activée/désactivée selon la dernière configuration en mémoire.

Etat d'activation/désactivation de la sortie	Limite de sous-tension
Réglage de la tension de sortie	Réglage OCP
Réglage du courant de sortie	Face avant verrouillée/déverrouillée
Niveau OVP	Mode de démarrage

Coupure de plusieurs alimentations

Il est possible de configurer un système à plusieurs alimentations de façon à arrêter toutes les alimentations 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.
A la suppression de l'anomalie, toutes les alimentations retrouvent leur état initial, selon le réglage 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 contact de type circuit ouvert/court-circuit (référencé 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 d'excursion haute 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 quand la sortie est à l'état bas.

Interrupteurs 1 et 2 de SW1	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 en court-circuit	0~0,6 V	Analogique
	1 ou en circuit ouvert	Ouvert	Locale

Programmation de la tension et du courant de sortie par une tension

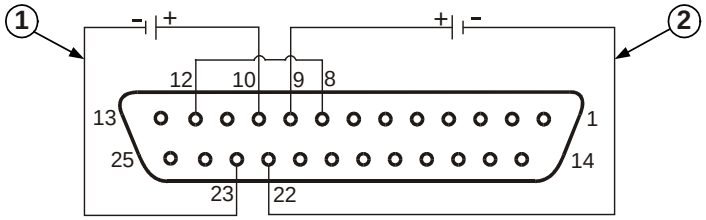
ATTENTION Les broches 12, 22 et 23 de J1 sont connectées en interne à la borne de détection négative. Ne référencez pas ces broches à une autre borne que celle de détection négative, car cela pourrait endommager l'alimentation.

Pour conserver l'isolement de l'alimentation et 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 du commutateur de configuration SW1 pour sélectionner la plage de tension de programmation selon le tableau suivant. Vérifiez que les interrupteurs 1 et 2 du commutateur de configuration 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 de 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 de courant.
2 – Programmation de la tension de sortie.

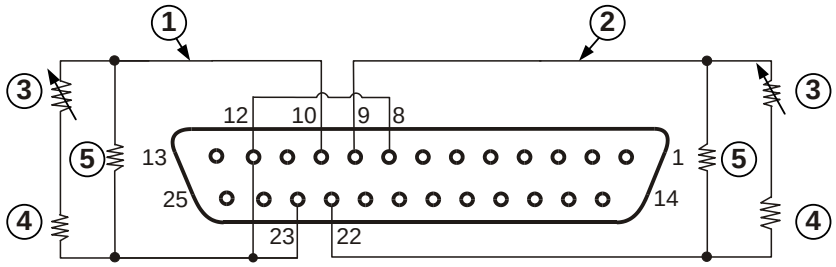
Programmation de la tension et du courant de sortie par une résistance

ATTENTION Les broches 12, 22 et 23 de J1 sont connectées en interne à la borne de détection négative. Ne référencez pas ces broches à une autre borne que celle de détection négative, car cela pourrait endommager l'alimentation.

Des résistances de 0 – 5 kΩ ou de 0 – 10 kΩ 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 du commutateur de configuration SW1 pour sélectionner la plage de résistance de programmation selon le tableau suivant. Vérifiez que les interrupteurs 1, 2, 7 et 8 du commutateur de configuration 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 kΩ	0 – 5 kΩ
Position haute	0 – 10 kΩ	0 – 10 kΩ

Branchez les résistances de programmation au connecteur de 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 et 23 de J1.



1 – Programmation de la limite de 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 du commutateur de configuration SW1. Les signaux de surveillance représentent 0 à 100 % des valeurs nominales de la tension et du courant de sortie de l'alimentation. Les sorties de surveillance ont une résistance de sortie en série de 500 Ω. Assurez-vous que le circuit de détection a une résistance en entrée supérieure à 500 kΩ ou la précision sera 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 N8700 accepte la communication par interface de commande à distance en utilisant trois interfaces au choix : GPIB, USB et LAN. Les trois interfaces sont actives dès la mise sous tension. Pour de plus amples informations sur la configuration et l'utilisation des interfaces de commande à distance, reportez-vous au guide de l'utilisateur (*User's Guide*) livré avec votre instrument.

Ces informations sont sujettes à modification sans préavis.
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Novembre 2014
www.keysight.com

Keysight Technologies
システムDC電源
N8700シリーズ

クイック・リファレンス・ガイド

KEYSIGHT TECHNOLOGIES

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は、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は、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に、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は、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に、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は、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は、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は、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


家庭ゴミとして廃棄しないでください。

法的注意事項

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目次

Keysight N8700 DC 電源システムの概要

Keysight N8700シリーズシステムDC電源は、広範囲の出力電圧／電流定格に対応した高さ2U（2ラック・ユニット）の汎用スイッチング電源です。3.3 kWと5 kWのモデルがあります。

これらの電源は力率補正されていて、柔軟なACライン電源入力電圧オプションを備えています。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
- 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

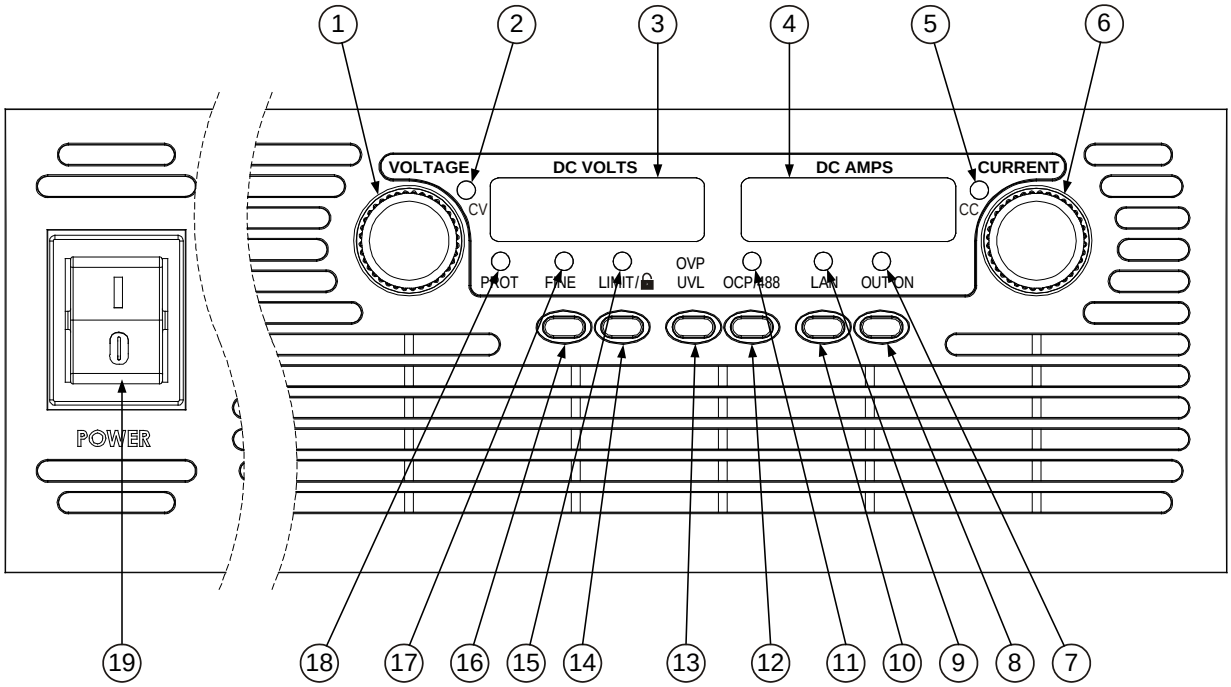
- 出力電圧および電流設定
- 出力電圧および電流測定
- 出力電圧および電流トリガ設定
- 出力オン／オフ制御
- 過電流保護設定
- 過電圧保護設定およびリードバック
- 不足電圧制限値設定およびリードバック
- 起動モード（前回の設定またはリセット・モード）
- ステータス・レジスタ設定およびリードバック
- バス・トリガ
- 校正

モデル定格

3.3 kW モデル			5 kW モデル		
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
N8731A	0～8 V	0～400 A	N8754A	0～20 V	0～250 A
N8732A	0～10 V	0～330 A	N8755A	0～30 V	0～170 A
N8733A	0～15 V	0～220 A	N8756A	0～40 V	0～125 A
N8734A	0～20 V	0～165 A	N8757A	0～60 V	0～85 A
N8735A	0～30 V	0～110 A	N8758A	0～80 V	0～65 A
N8736A	0～40 V	0～85 A	N8759A	0～100 V	0～50 A
N8737A	0～60 V	0～55 A	N8760A	0～150 V	0～34 A
N8738A	0～80 V	0～42 A	N8761A	0～300 V	0～17 A
N8739A	0～100 V	0～33 A	N8762A	0～600 V	0～8.5 A
N8740A	0～150 V	0～22 A			
N8741A	0～300 V	0～11 A			
N8742A	0～600 V	0～5.5 A			

注記 1: 最小出力電圧は定格出力電圧の 0.2 %以下です。
注記 2: 最小出力電流は定格出力電流の 0.4 %以下です。

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は、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。FINE ボタンを押すと微調整分解能に設定できます。

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 – VOLTAGE インジケータ

本器が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

通常はセンス端子で測定された電圧が表示されます。

- LIMIT ボタンを押すと、プログラムされた電圧設定が表示されます。
- OVP/UVL ボタンを押すと、OVP または UVL 設定が表示されます。
- OCP/488 ボタンを押し続けると、GPIB アドレスが表示されます。
- LAN ボタンを押し続けると、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

通常は出力端子で測定された電流が表示されます。

- LIMIT ボタンを押すと、プログラムされた電流設定が表示されます。
- LAN ボタンを押し続けると、IP アドレスとイーサネット・アドレスが表示されます。

5 – CURRENT インジケータ

本器が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。FINE ボタンを押すと微調整分解能に設定できます。

7 – 出力オン・インジケータ

出力がオンになっていることを示します。

8 – 出力オン・ボタン

出力機能：OUT ON ボタンを押すと、出力をオン／オフできます。OVP または OCP イベントのあとで OUT ON ボタンを押すと、本器をリセットして出力をオンに戻すことができます。

起動機能：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。

9 – LAN インジケータ

LAN が設定され、正常に動作していることを示します。N8700 ユニットの Web ホームページで別のユニットを設定すると、LAN インジケータが点滅してそのユニットを示します。

10 – LAN ボタン

アドレスの表示：LAN ボタンを押すと、IP アドレスとイーサネット・アドレスを表示できます。ディスプレイには最初に IP アドレスの 4 つのセグメントが順に表示され、その後でイーサネット（EA）アドレスの 6 つのセグメントが順に表示されます。任意のキーを押すとアドレス表示がオフになります。

アドレスのリセット：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 設定が出荷時設定にリセットされます（設定については第 4 章を参照）。LAN ボタンをもう一度押さなかった場合は、ディスプレイは通常に戻り、設定は変更されません。

11 – OCP/488 インジケータ

過電流保護がオンになっていることを示します。

12 – OCP/488 ボタン

OCP オン：OCP/488 ボタンを押すと、過電流保護がオンになります。OCP/488 ボタンをもう一度押すと、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後で、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。

GPIB アドレス：OCP/488 ボタンを 3 秒間押し続けると、電圧ノブで GPIB アドレスを設定できるようになります。

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 ボタンを 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 ボタンを 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 ボタンを押すと、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（LFP）とロック解除（UFP）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 と表示される場合は、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

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

電圧および電流ノブの微調整または粗調整制御を設定します。
FINE ボタンを押すと微調整モードに設定され、もう一度押すと粗調整モードに戻ります。
- 微調整モード：ノブは高分解能で動作します。
- 粗調整モード：ノブは低分解能で動作します（約 6 回転）。

17 – 微調整インジケータ

本器が高分解能の微調整モードに設定されていることを示します。

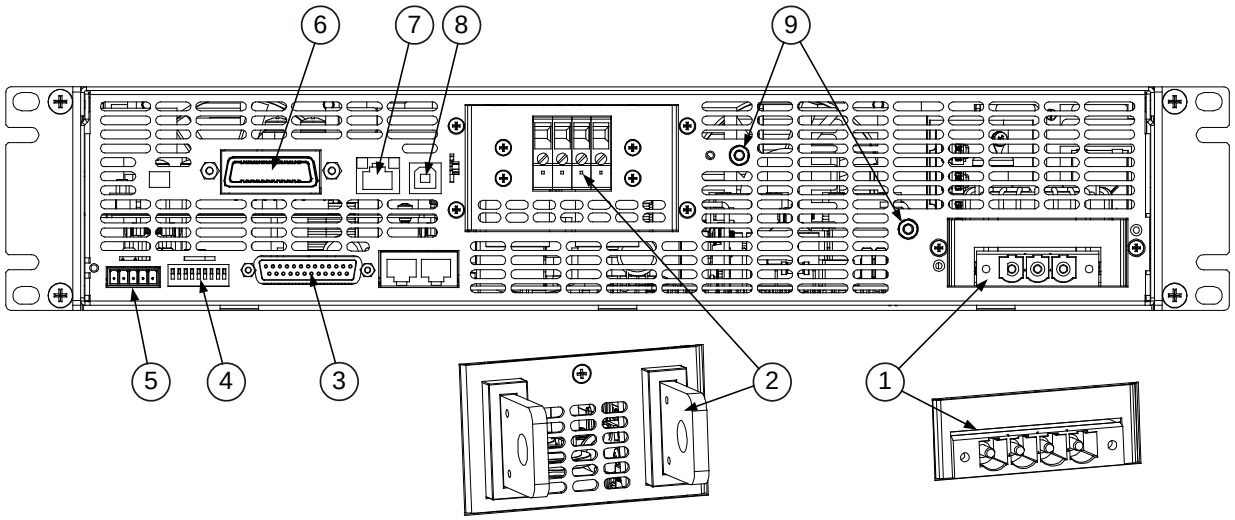
18 – 保護インジケータ

異常が発生した場合に点滅します。
PROT（保護）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



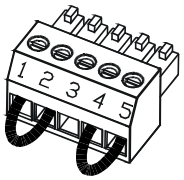
1 – AC ライン電源入力コネクタ	3.3 kW 出力および 5 kW 出力の両方のモデル用の差し込みプラグ・コネクタを備えたヘッダ。 3 端子プラグは単相交流電圧用です。 4 端子プラグは 3 相交流電圧用です。
2 – DC 出力コネクタ	150 V、300 V、600 V モデルでは、ワイヤ・クランプ・コネクタが使用されます。 8 V～100 V モデルでは、バス・バーが使用されます。
3 – アナログ・プログラミング・コネクタ	アナログ・インタフェース用コネクタ。出力電圧／電流制限値のプログラミングと信号のモニタ、シャットオフ制御（電気信号）、オン／オフ制御（ドライ接点）、電源 OK 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）。
4 – 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）。
5 – 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）。
6 – 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（セットアップについては第 4 章を参照）。
7 – 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 セットアップについては第 4 章を参照してください。
8 – 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。セットアップについては第 4 章を参照してください。
9 – グランドねじ／ナット	シャーシ・グランド接続のための M4×8 ナット付きねじ。

警告

感電の危険：AC 電源ライン・ケーブルにはシャーシ・グランドのためのグランド線があります。必ず、単相モデルの場合は 3 線、3 相モデルの場合は 4 線の電源を使用し、グランド線（緑／黄）をアースに接続してください。

J2 センス・コネクタ

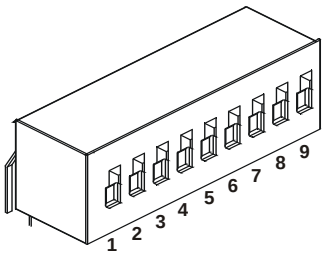
1 – リモート・センス（＋）
2 – ローカル・センス（＋）
3 – 未使用
4 – ローカル・センス（–）
5 – リモート・センス（–）



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。

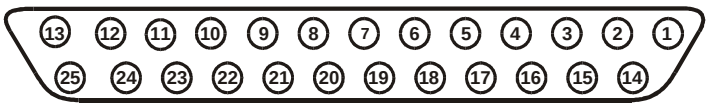
SW1 セットアップ・スイッチ



出荷時の設定は全スイッチが下位置です。

1 – 出力電圧、電圧プログラミング	下:出力電圧はフロントパネルからプログラムします。 上: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、電圧プログラミング	下:出力電流はフロントパネルからプログラムします。 上: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（電圧／抵抗）	下: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 上: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 – 電圧および電流モニタリング・レンジ	下:リモート・モニタリング・レンジは次のとおり:0～5 V 上: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	下: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 上: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、抵抗プログラミング	下:出力電圧はフロントパネルからプログラムします。 上: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、抵抗プログラミング	下:出力電流はフロントパネルからプログラムします。 上: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	下:J1 オン＋／オン-ピンは非アクティブ 上: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シングのための出力。

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に達す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 N8700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は、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、#10-32×9.7 mm（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に、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に、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：電源ケーブルにはシャーシ・グランドのためのグランド線があります。電源ケーブルのグランド線は、必ず電源と本器の AC 入力コネクタの両方でアースに接続してください。

火災の危険：本器に付属の電源ケーブル以外は使用しないでください。他の電源ケーブルを使用すると、ケーブルが過熱して火災の原因となるおそれがあります。

警告

AC ライン電源への接続：電源は、次の定格を持つサーキット・ブレーカまたはヒューズなどの保護装置を通じて AC 主電源に接続する必要があります。
単相モデルの場合：1 相あたり最大 30 A
3 相モデルの場合：1 相あたり最大 20 A

注意

3,3 kW または 5 kW 電源を AC ライン電源に接続する作業は、有資格者が電気法規に従って行う必要があります。

電源オン／オフ・スイッチは断路装置ではなく、すべての回路をAC電源から完全に切断するものではありません。最終的な設置の際には、永久的または多相構成用のスイッチまたはサーキット・ブレーカを断路装置として使用する必要があります。

断路装置は、UL/CSA/EN 61010-1の要件を満たす必要があります。断路装置は機器のすぐ近くにあり、容易に操作可能で、この機器の断路装置であることが明示されている必要があります。断路装置は、各ユニットの上部カバーの入力定格ラベルに記載された入力定格要件を満たす必要があります。

各ユニットには、次のどれかの未終端電源ケーブルが付属しています。必要な場合は、電源ケーブルの末端に適切なロッキング型の電源プラグを接続してください。

ケーブル・オプション／パーツ番号	概要	定格	ワイヤ径：	長さ	承認
オプション 831、パーツ番号 8121-1949	3.3 kW 単相	300 V、25 A、60 ℃	3 × 10 AWG 注記 1、3	2.5 m	UL/CSA
オプション 832、パーツ番号 8121-1331	3.3 kW 単相	250 V、32 A、60 ℃	3 × 4 mm^2 注記 1	2.5 m	ハーモナイズド
オプション 861、パーツ番号 8121-1946	3.3 kW/5 kW 3 相（公称 190～240 Vac）	300 V、25 A、90 ℃	4 × 10 AWG 注記 2、3	2.5 m	UL/CSA
オプション 862、パーツ番号 8121-1948	3.3 kW/5 kW 3 相（公称 380～415 Vac）	450 V、20 A、70 ℃	4 × 2.5 mm^2 注記 2	2.5 m	ハーモナイズド

注記 1：2 線＋緑／黄の安全用アース線
注記 2：3 線＋緑／黄の安全用アース線
注記 3：10 AWG は 4 mm^2 に相当

3.3 kW ユニットと 5 kW ユニットの入力接続

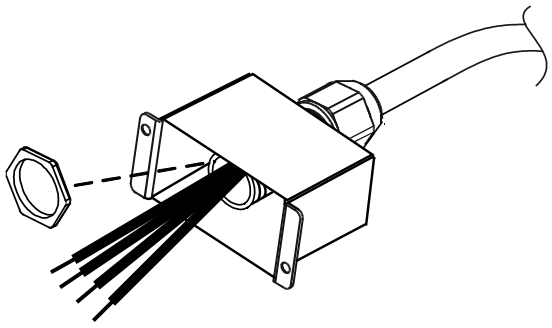
AC電源ライン入力コネクタはリアパネルにあります。3.3 kW単相ユニットの場合は3端子ワイヤ・クランプ、3.3 kWおよび5 kW 3相ユニットの場合は、4端子ワイヤ・クランプです。入力電圧／電流定格は次の通りです。

ユニット	公称 AC 電源ライン入力	100 %負荷での入力電流	周波数
3.3 kW 単相	190～240 Vac	最大 23～24 A	50/60 Hz
3.3 kW 3 相	190～240 Vac 380～415 Vac	最大 13.6～14.5 A 最大 6.8～7.2 A	50/60 Hz 50/60 Hz
5 kW 3 相	190～240 Vac 380～415 Vac	最大 21～22 A 最大 10.5～12 A	50/60 Hz 50/60 Hz

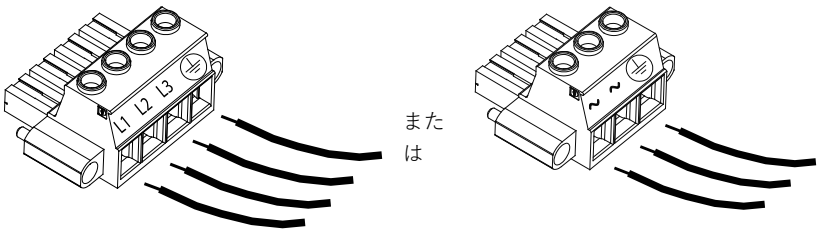
注記 **本器の電源ラインの電圧定格は変更できません。電源ラインの電圧定格が AC ライン電源に適合しない場合は、本器を工場に返送して改修する必要があります。**

ケーブルを次のようにAC入力コネクタに接続します。

1. ACケーブルの絶縁外被を約10 cm剥きます。緑／黄のグランド・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10 mm剥きます。
2. 緩衝部の基部を回してワイヤ・コンプレッション・ナットから外します。ロックナットの平らな側がカバーに当たるようにして、ナットをAC電源ライン入力カバーの内側に入れます。基部をAC電源ライン入力カバーの外部の開口部から挿入します。基部を外側からロックナットにしっかりとねじ止めします。締め付けトルク：
   23 Nm。
3. ワイヤ・コンプレッション・ナットをACケーブルに沿ってすべらせます。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内側の端と揃うようにします。基部にレンチをあてがって基部が回らないようにします。ケーブルをそのままの位置に保持しながら、コンプレッション・ナットを基部に固定します。締め付けトルク：19～22 Nm。次の図を参照してください。

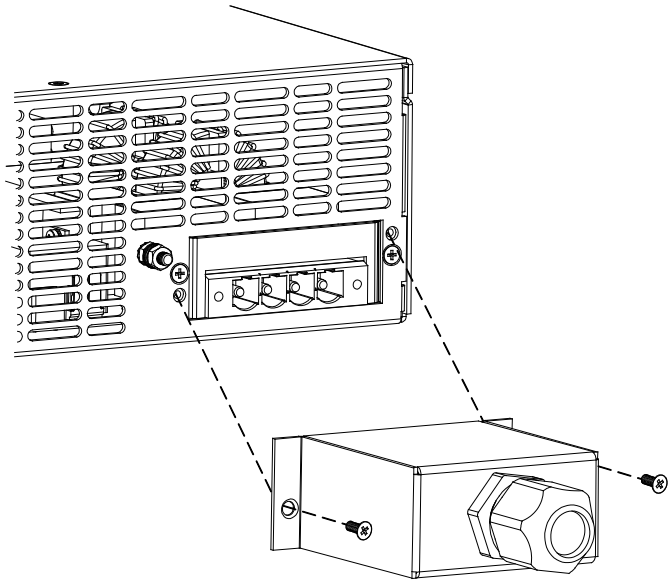


4 ACワイヤを必要な入力コネクタ端子に接続します。ワイヤを接続するには、次の図に示すように、端子ねじを緩め、ワイヤの剥いた部分を端子に挿入し、ねじをしっかりと締めます。緑／黄のグランド線を必ずコネクタのグランド端子に接続してください。コネクタをリアパネルのヘッダに差し込み、両側のねじで固定します。ねじの締め付けトルク：1.2～1.5 Nm。



プラグの種類:	PC 6/4-STF-10、16 または PC 6/3-STF-10、16 Phoenix
ワイヤ径:	AWG 18～AWG 8
ストリップ長さ:	12 mm
トルク:	1.2～1.5 Nm

5 カバーを取り付けるためにリアパネルの方に滑らせるときにワイヤを挟まないように、ワイヤをカバーの中に通します。付属のM3×8 mm平皿ねじを使ってカバーを本器に固定します。ねじの締め付けトルク：0.54 Nm。次の図を参照してください。



負荷の接続（8V～100V モデル）

警告

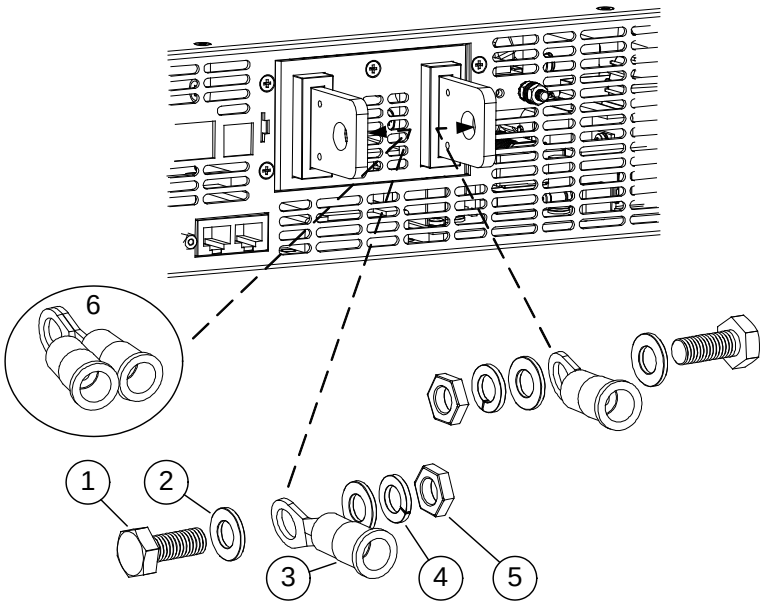
感電の危険：リアパネルに接続を行う際には、AC 電源をオフにしてください。ワイヤとストラップは正しく接続し、ねじをしっかりと締めてください。

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

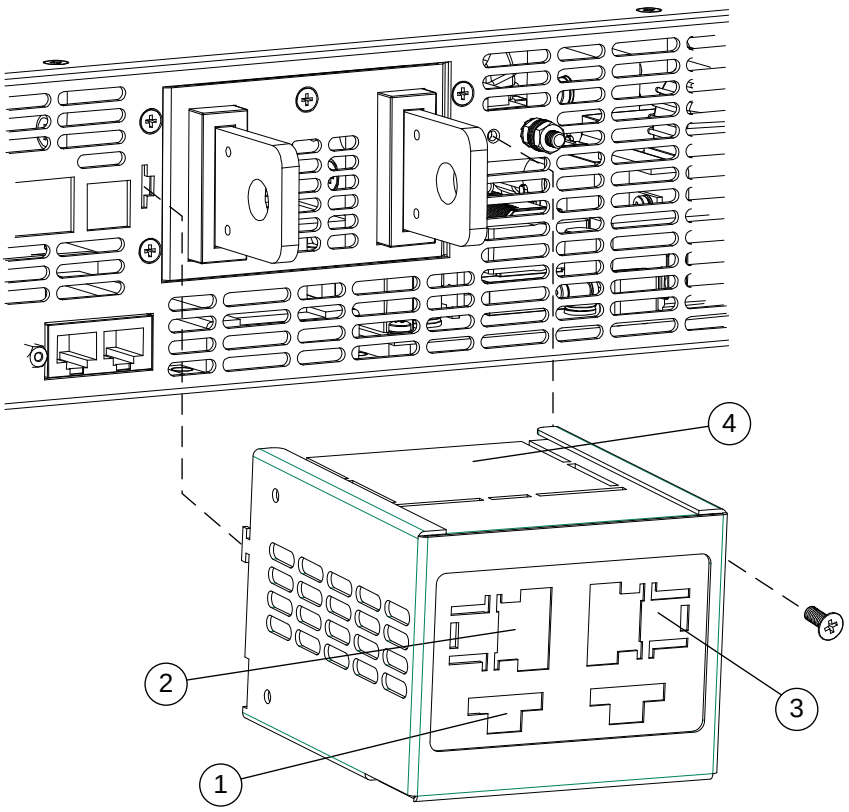
取付け金具によって出力端子が短絡されないように注意してください。接続ケーブルが重い場合は、接続が緩んだりバス・バーが曲がったりするのを防ぐために、何らかの緩衝部を使用してください。

1 次の図に示すように、すべての負荷ワイヤはワイヤ端子ラグ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。ワイヤ端子をバス・バーの*内部*に接続して、シールドを設置するのに十分なスペースを確保してください。



1 – ねじ　**2 – 平ワッシャ**　**3 – ワイヤ端子ラグ**
4 – ばねワッシャ　**5 – ナット**　**6 – 並列ラグ**

2 負荷ワイヤの接続が終了したら、シールドを固定します。必要な場合は、次の図に示すように、径の大きいワイヤ用の適切なカットアウトを除去します。左側のタブと、右側のM3×8 mm平皿ねじを使用して、シールドを固定します。ねじの締め付けトルク：0.54～0.6 Nm



1 – AWG 4～10 のワイヤ用の開口部。
2 – AWG 2～1/0 のワイヤ用の開口部。小さいカットアウトを除去。
3 – AWG 2/0 – 3/0 のワイヤの場合はこのカットアウトを除去。
4 – バス・レールを設置する場合はこのカットアウトを除去。

負荷の接続（150 V、300 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。

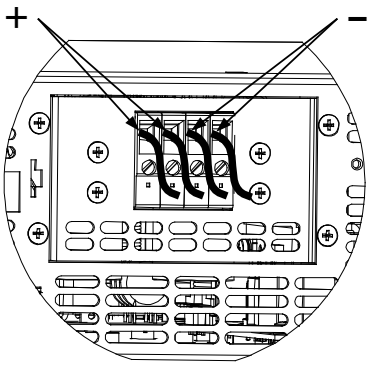
150 V、300 V、600 Vのモデルには、4端子ワイヤ・クランプ出力コネクタが装備されています。左の2つの端子が正の出力、右の2つの端子が負の出力です。コネクタの仕様は次のとおりです。

ワイヤ径:	AWG 18～AWG 10
ストリップ長さ:	10 mm
トルク:	0.5～0.6 Nm。

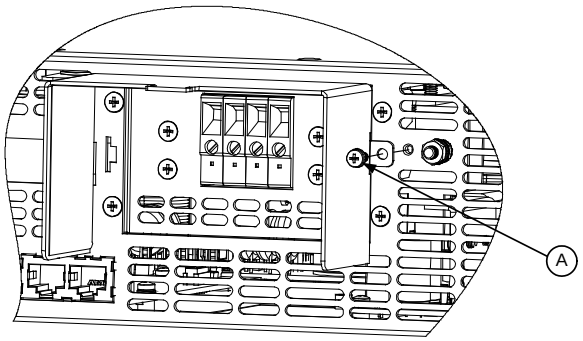
負荷ワイヤを次のように本電源の出力ワイヤ・クランプ・コネクタに接続します。

1 ワイヤを約10 mm剥きます。

2 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。



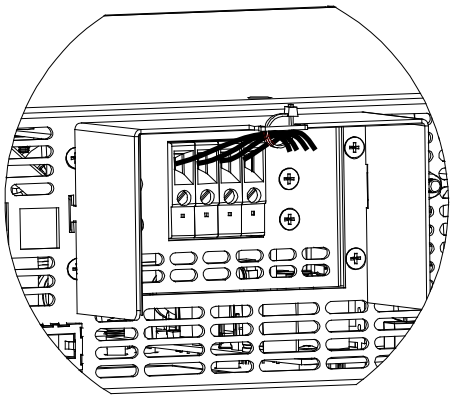
3 Aという印の付いたシャーシねじを緩めて取り外します（保管しておきます）。



4 保護シールドの左側にあるスロット付きタブをシャーシ・スロットに滑り込ませ、定位置に固定します。先に取り外した右側のシールドねじを挿入して、シールドをシャーシに固定します。ねじの締め付けトルク：0.54～0.6 Nm

5 負荷ワイヤを、シールドの上部のタブに通します。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。

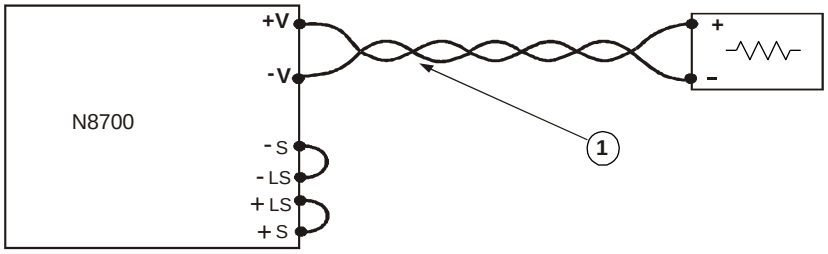
6 次の図に示すように、切り込みの入ったシールド・タブに負荷ワイヤをタイラップなどで固定します。



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。

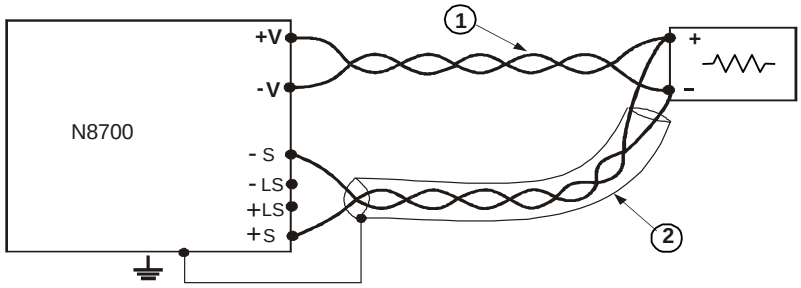


1 – 負荷ライン＝ツイスト・ペア：できるだけ短く

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に、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は、シールドは電源シャーシまたは負荷グランドのどちらか一方の点でグランドに接続します。

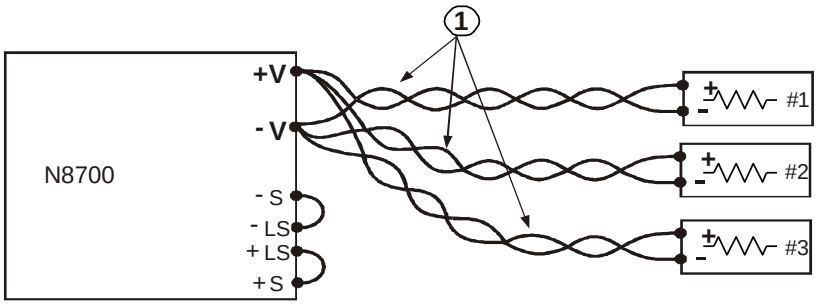


1 – 負荷ライン＝ツイスト・ペア：できるだけ短く
2 – センス・ライン＝ツイスト・ペア／シールド線

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に、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。

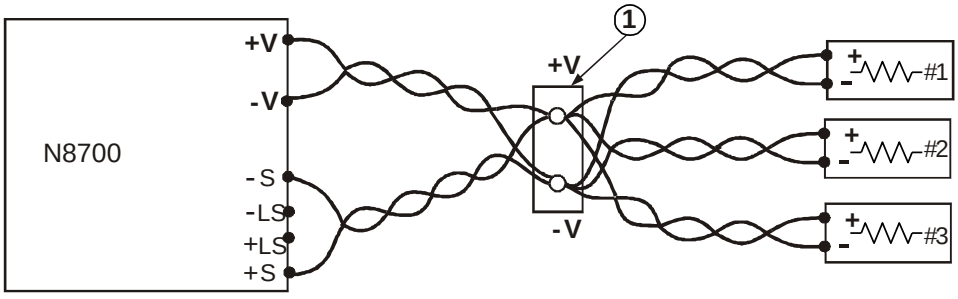


1 – 負荷ライン＝ツイスト・ペア：できるだけ短く

次の図のようにリモート分配端子を使用する場合は、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に、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。

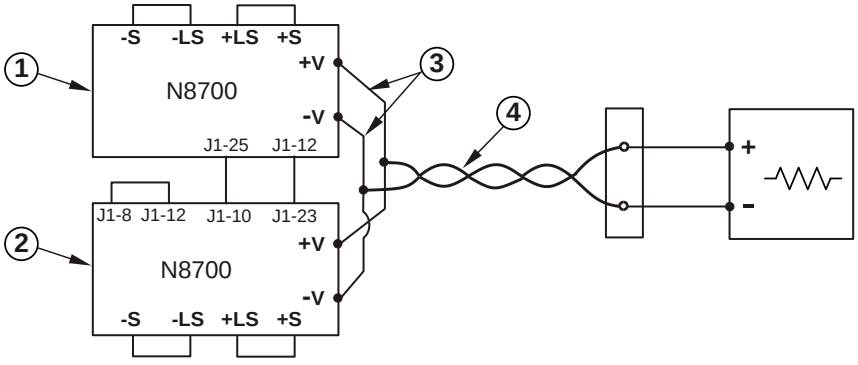
定格出力が 60 Vdc より大きいモデルでは、負の出力のすべてのポイントがシャーシ・グランドから±400 Vdc 以内でなければなりません。

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。**

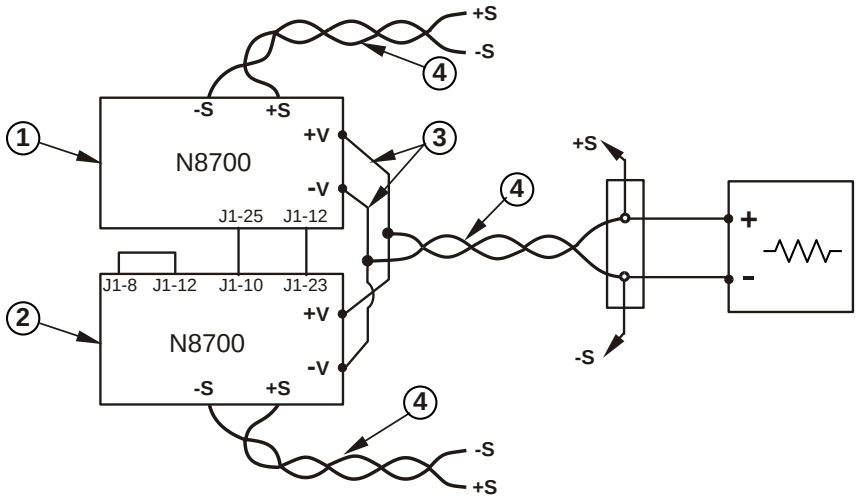
定格電圧および電流が一致する電源を4台まで並列に接続することにより、最大4倍の出力電流を得ることができます。次の図は2台の電源を接続した例ですが、同じ接続方式で4台までの電源を接続できます。

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は、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す。



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J1ピン23（電流プログラム・リターン）をマスタ・ユニットのJ1ピン12（コモン）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に、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。

必要な場合は、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。

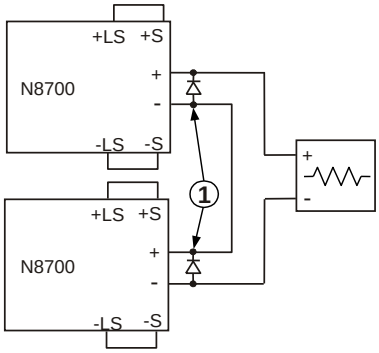
定格出力が 60 Vdc より大きいモデルでは、負の出力のすべてのポイントがシャーシ・グランドから±400 Vdc 以内でなければなりません。

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。

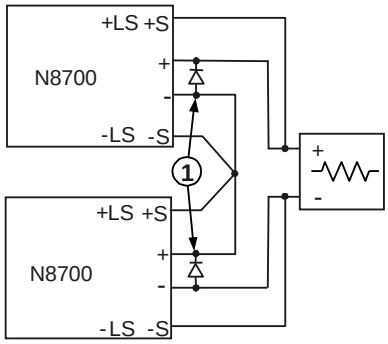
定格電圧および電流が一致する電源を2台直列に接続することにより、最大2倍の出力電圧を得ることができます。直列回路の各素子を流れる電流は等しいので、直列に接続する出力は**必ず**電流定格が一致しなければなりません。

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に、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。

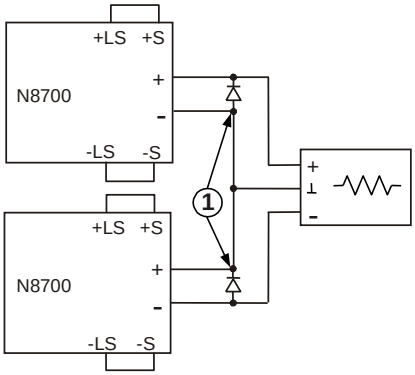
以下の図は、ローカル・センシングとリモート・センシングを使った直列接続を示します。また、直列接続した電源を正と負の出力として構成する例も示します。



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は、フロントパネルのCVインジケータが点灯します。

出力がオンの場合は、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。出力がオフの場合は、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は、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は、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は、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は、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。

出力がオフの場合は、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に、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30V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は、CV/CC出力はオープンです。定電流モード動作の場合は、CV/CC信号出力はロー（0～0.6 V）であり、シンク電流は最大10mA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ボタンを押して、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（LFP）とロック解除（UFP）を切り替えることができます。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。オフにした場合は、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は、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	Display
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に、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	Display	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は、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

過電流保護

過熱保護

AC 電源異常

オン／オフ信号が真

シャットオフ信号が真

インタフェース異常

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。

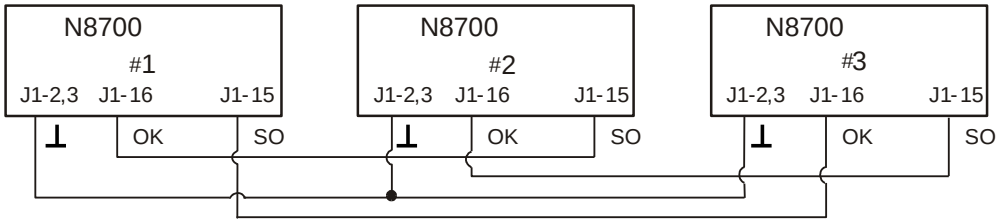
自動リスタート・モードでは、電源をオフにしたときに動作設定が保存され、再びオンにしたときに復元されます（次のリストを参照）。出力は、前回の設定に応じてオンまたはオフになります。

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かを示します。この出力を使用するには、プルアップ抵抗を最大30Vdc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

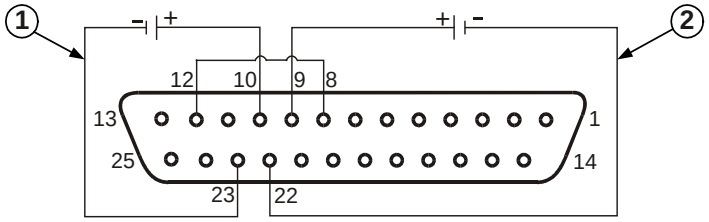
注意 J1 のピン 12、ピン 22、ピン 23 は、内部で負センス端子に接続されています。これらのピンの基準を負センス端子以外にすることは、本器を損傷するおそれがあるため避けてください。

電源のアイソレーションを保ち、グランド・ループを避けるために、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

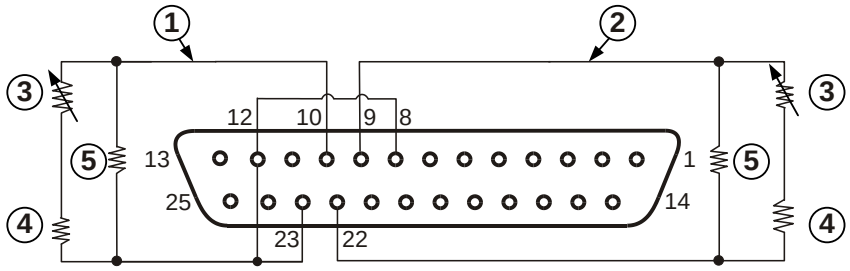
出力電圧および電流の抵抗プログラミング

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とJ1ピン23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 N8700 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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Keysight Technologies
시스템 DC 전원 공급기
N8700 시리즈

빠른 참조 설명서

KEYSIGHT TECHNOLOGIES

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

제조자가 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 섀시와 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 Keysight 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 만족 되지 않는 경우 작업을 진행하지 마십시오.

감전 위험

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


3 상 교류


접지 단자


보호용 접지 단자


프레임 또는 섀시 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.

2 단 누름 단추가 눌린 상태


2 단 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 Keysight Technologies 의 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 Keysight는 어떠한 명시적 또는 묵시적 보증을 하지 않습니다. Keysight는 본 문서 혹은 여기에 포함된 정보의 오류나 이를 제공, 사용 또는 실행하는 것과 관련하여 발생하는 파생적 또는 부수적 손해에 대해 책임지지 않습니다. Keysight와 사용자가 별도 작성한 서면 동의서에 이러한 조건과 상반되는 본 문서의 내용을 다루는 보증 조건이 있다면 별도 동의서의 보증 조건이 적용됩니다.

목차

Keysight N8700 DC 전원 공급기 - 개요

Keysight Technologies의 N8700 시리즈 시스템 DC 전원 공급기는 매우 폭 넓은 정격 출력 전압과 전류를 제공하는 범용 스위칭 전원 공급기입니다. 3.3kW와 5kW 모델 두 가지가 있습니다.

이 전원 공급기는 전력 인자로 교정되어 있으며 유연한 AC 입력 전압 옵션을 가지고 있습니다. 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 교정
- 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

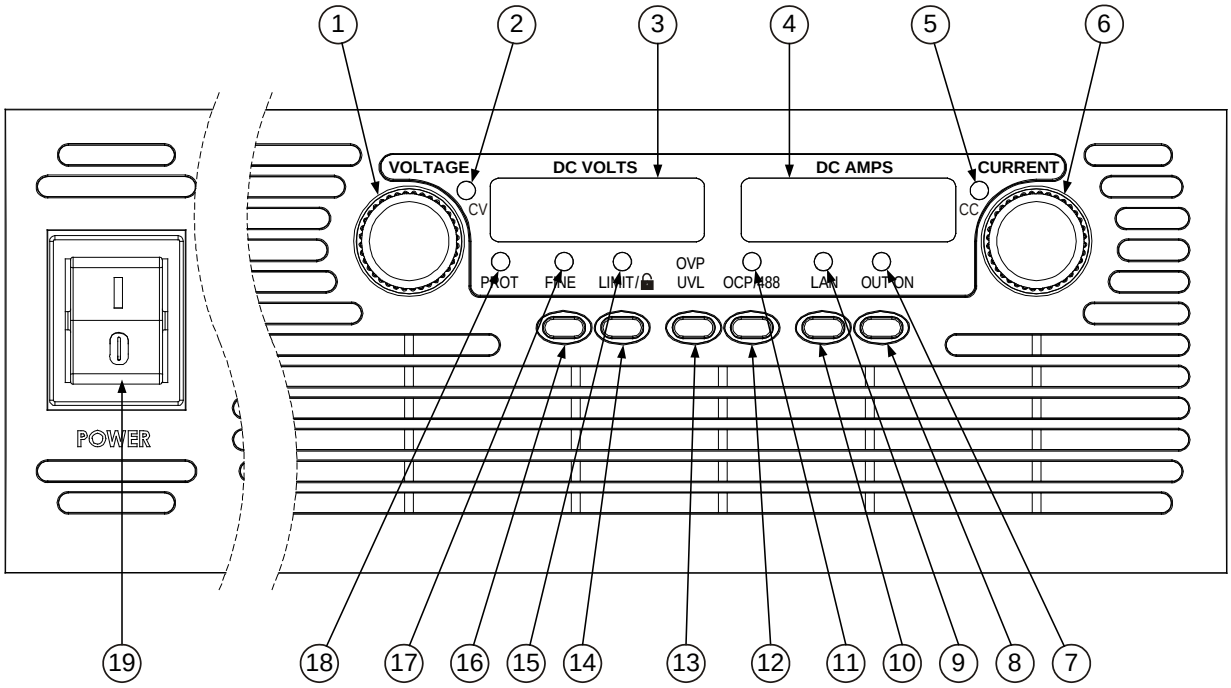
모델 정격

3.3kW 모델			**5kW 모델**		
모델	**전압 범위**	**전류 범위**	**모델**	**전압 범위**	**전류 범위**
N8731A	0 – 8V	0 – 400A	N8754A	0 – 20V	0 – 250A
N8732A	0 – 10V	0 – 330A	N8755A	0 – 30V	0 – 170A
N8733A	0 – 15V	0 – 220A	N8756A	0 – 40V	0 – 125A
N8734A	0 – 20V	0 – 165A	N8757A	0 – 60V	0 – 85A
N8735A	0 – 30V	0 – 110A	N8758A	0 – 80V	0 – 65A
N8736A	0 – 40V	0 – 85A	N8759A	0 – 100V	0 – 50A
N8737A	0 – 60V	0 – 55A	N8760A	0 – 150V	0 – 34A
N8738A	0 – 80V	0 – 42A	N8761A	0 – 300V	0 – 17A
N8739A	0 – 100V	0 – 33A	N8762A	0 – 600V	0 – 8.5A
N8740A	0 – 150V	0 – 22A			
N8741A	0 – 300V	0 – 11A			
N8742A	0 – 600V	0 – 5.5A			

참고 1: 최소 출력 전압은 정격 출력 전압의 0.2% 미만입니다.

참고 2: 최소 출력 전류는 정격 출력 전류의 0.4% 미만입니다.

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. FINE 버튼을 눌러 분해능을 높입니다.

GPIB 주소: OCP/488 을 누르고 있으면 GPIB 주소가 선택됩니다.

2 – 전압 표시기

장치가 출력 전압을 일정하게 유지하는 정전압 모드 상태임을 나타냅니다.

3 – DC 전압 디스플레이

일반적으로 감지 단자에서 측정된 전압을 표시합니다.
- LIMIT 버튼을 누르면 프로그램된 전압 설정이 표시됩니다.
- OVP/UVL 버튼을 누르면 OVP 또는 UVL 설정이 표시됩니다.
- OCP/488 버튼을 누르고 있으면 GPIB 주소가 표시됩니다.
- LAN 버튼을 누르고 있으면 IP 및 이더넷 주소가 표시됩니다.

4 – DC AMPS 디스플레이

일반적으로 출력 단자에서 측정된 전류를 표시합니다.
- LIMIT 버튼을 누르면 프로그램된 전류 설정이 표시됩니다.
- LAN 버튼을 누르고 있으면 IP 및 이더넷 주소가 표시됩니다.

5 – 전류 표시기

장치가 출력 전류를 일정하게 유지하는 정전류 모드 상태임을 나타냅니다.

6 – 전류 노브

출력 전류를 조절합니다. FINE 버튼을 눌러 분해능을 높입니다.

7 – OUT ON 표시기

출력이 사용 또는 ON 임을 나타냅니다.

8 – OUT ON 버튼

출력 기능: OUT ON 버튼을 눌러 출력을 끄거나 켭니다. OUT ON 버튼을 누르면 OVP 또는 OCP 이벤트 이후에 장치가 재설정되고 출력이 켜집니다.

시작 기능: OUT ON 버튼을 누르고 있으면 안전 시작과 자동 재시작 모드가 번갈아가며 바뀝니다. 디스플레이는 SAF 와 AU7 이 번갈아가며 바뀝니다. 이 모드 중 하나가 표시될 때 OUT ON 버튼을 놓으면 해당 모드가 선택됩니다.

9 – LAN 표시기

LAN 이 구성되었으며 정상적으로 작동하고 있음을 나타냅니다. N8700 장치의 웹 홈페이지에서 다른 장치를 설정하면 LAN 표시기가 깜박거리며 해당 장치를 식별해 줍니다.

10 – LAN 버튼

주소 보기: LAN 버튼을 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.

주소 재설정: 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 4 장 참조). 디스플레이는 정상으로 돌아오고 LAN 버튼을 다시 누르지 않으면 구성은 변경되지 않습니다.

11 – OCP/488 표시기

과전류 보호가 사용 또는 ON 임을 나타냅니다.

12 – OCP/488 버튼

OCP 설정: OCP/488 버튼을 눌러 과전류 보호를 켭니다. OCP/488 버튼을 다시 누르면 과전류 보호가 꺼집니다.

OCP 재설정: 과전류 보호 이벤트가 발생하면 OUT ON 버튼을 눌러 출력을 켜고 과전류 보호를 재무장시킵니다.

GPIB 주소: OCP/488 버튼을 3 초동안 누르면 전압 노브로 GPIB 주소를 설정할 수 있습니다.

13 – OVP/UVL 버튼

OVP 기능: OVP/UVL 버튼을 한 번 눌러 전압 노브의 과전압 보호 레벨을 정합니다(디스플레이에 OUP 가 표시됨). 현재 출력 전압 설정 위쪽으로 약 5% 이하로는 과전압 보호를 설정할 수 없습니다.

UVL 기능: OVP/UVL 버튼을 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.

14 – LIMIT 버튼

한계 기능: LIMIT 버튼을 눌러 출력 전압과 전류 한계를 표시합니다. 디스플레이에 5 초 동안 설정이 표시된 다음 실제 출력 전압과 전류로 바뀝니다.

잠금 기능: LIMIT 버튼을 누르고 있으면 전면 패널 '잠금'(LFP)과 전면 패널 '잠금 해제'(UFP) 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.

15 – LIMIT 표시기

LIMIT 버튼을 누르면 표시됩니다.

16 – FINE 버튼

전압과 전류 노브에 대해 Fine 또는 Coarse 조정 제어를 설정합니다.
FINE 버튼을 누르면 Fine 모드가 설정되고, 다시 누르면 Coarse 모드로 전환됩니다.
- Fine 모드: 노브가 고 분해능으로 작동합니다.
- Coarse 모드: 노브가 저 분해능(대략 6 회전)으로 작동합니다.

17 – FINE 표시기

장치가 고 분해능 'Fine' 조정 모드 상태임을 나타냅니다.

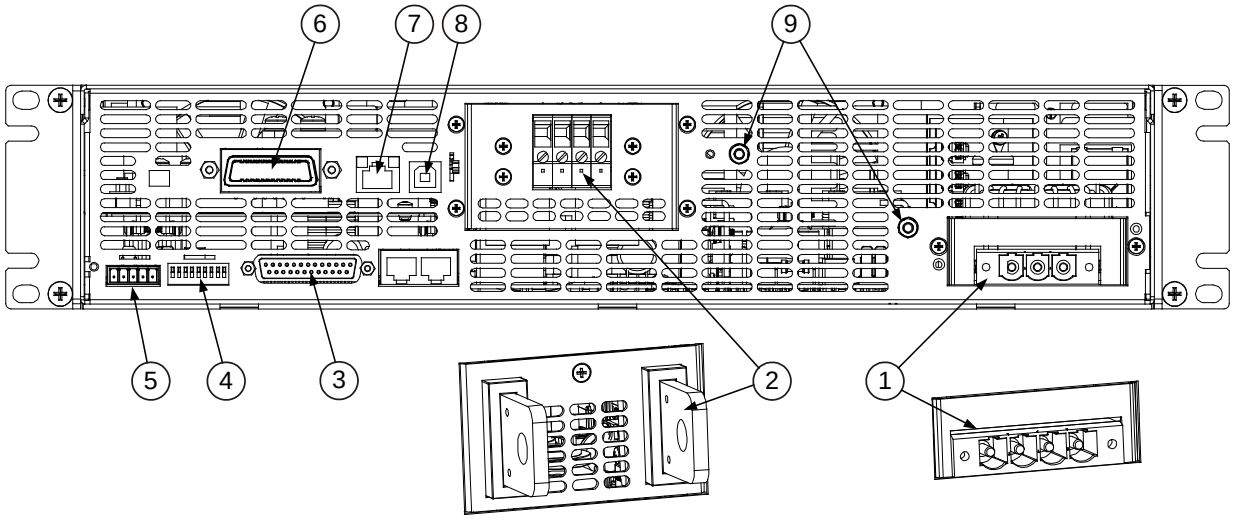
18 – PROT 표시기

장애가 발생하면 깜박거립니다.
OVP, OCP, OTP, Enable 장애 및 AC 장애가 감지되면 PROT(보호) 표시기가 깜박입니다. 장치를 끈 후에 몇 초간 장치 내부에 잔류 에너지가 남아있기 때문에 PROT 표시기가 깜박이고 디스플레이에 AC 가 표시될 수 있습니다.

19 – POWER 스위치

전원 공급기를 켜거나 끕니다.

후면 패널 - 개요



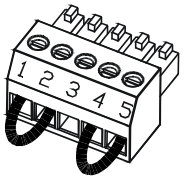
1 – AC 입력 커넥터	3.3kW 및 5kW 출력 모델 모두에 사용할 수 있는 결합 플러그인 커넥터가 있는 헤더 세 번째 컨덕터 플러그인은 단상 VAC 에 제공됩니다. 네 번째 컨덕터 플러그인은 3 상 VAC 에 제공됩니다.
2 – DC 출력 커넥터	와이어 클램프 커넥터는 150V, 300V 및 600V 모델에 사용되며, 버스 바는 8V ~ 100V 모델에 사용됩니다.
3 – 아날로그 프로그래밍 커넥터	아날로그 인터페이스용 커넥터. 출력 전압 및 전류 한계 프로그래밍과 감시 신호, 차단 제어(전기 신호), 설정/해제 제어(드라이 접촉), 전원 공급기 OK(Power Supply OK) 신호 및 작동 모드(CV/CC) 신호가 포함됩니다. (자세한 내용은 다음 페이지 참조)
4 – SW1 설정 스위치	출력 전압, 전류 한계 및 기타 제어 기능에 대한 원격 프로그래밍과 감시 모드를 선택하기 위한 9-위치 스위치 (자세한 내용은 다음 페이지 참조)
5 – 원격 감지 커넥터	로드 전압을 조절하고 배선 전압 강하를 보상하기 위해 원격 감지를 연결하기 위한 커넥터 (자세한 내용은 다음 페이지 참조)
6 – GPIB 커넥터	GPIB 인터페이스 연결용 커넥터 (설정에 대한 내용은 4 장 참조)
7 – LAN 커넥터	LAN 인터페이스 연결용 커넥터. LINK LED 는 링크 무결성을 나타냅니다. TX LED 는 LAN 작동을 나타냅니다. (LAN 설정에 대한 내용은 4 장 참조)
8 – USB 커넥터	USB 인터페이스 연결용 커넥터 (설정에 대한 내용은 4 장 참조)
9 – 접지 나사 및 너트	섀시 접지 연결을 위한 너트와 M4x8 나사

감전 위험

감전 위험! AC 전원 케이블의 접지 컨덕터가 섀시 접지로 사용됩니다. 접지 컨덕터(녹색/노랑)가 접지되어 있는 상태에서 전원이 단상 모델의 경우 세 번째 컨덕터, 3 상 모델의 경우 네 번째 컨덕터인지 확인하십시오.

J2 감지 커넥터

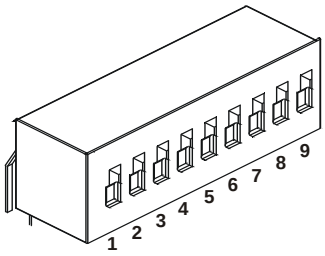
1 – 원격 감지(+)
2 – 로컬 감지(+)
3 – 미사용
4 – 로컬 감지(–)
5 – 원격 감지(–)



플러그 유형:	MC 1,5/5-ST-3,81 Phoenix
와이어 크기:	AWG 28 ~ AWG 16
피복 제거 길이:	7mm(0.28 인치)
토크:	1.95 – 2.21in-lb(0.22 – 0.25Nm)

그림에는 출고 시 구성을 나타내었습니다.

SW1 설정 스위치



모든 스위치에서 출고 시 설정은 아래입니다.

1 – 출력 전압, 전압 프로그래밍
아래: 전면 패널에서 출력 전압을 프로그래밍합니다.
위: 외부 전압 신호로 출력 전압을 프로그래밍합니다.

2 – 출력 전류, 전압 프로그래밍
아래: 전면 패널에서 출력 전류를 프로그래밍합니다.
위: 외부 전압 신호로 출력 전류를 프로그래밍합니다.

3 – 프로그래밍 범위 (전압/저항)
아래: 원격 프로그래밍 범위: 0 – 5V/0 – 5KΩ.
위: 원격 프로그래밍 범위: 0 – 10V/0 – 10KΩ.

4 – 전압 및 전류 감시 범위
아래: 원격 감시 범위: 0 -5V
위: 원격 프로그래밍 범위: 0 -10V

5 – 차단 논리 선택
아래: OUT OFF = 낮음(0 – 0.6V) 또는 단락, OUT ON = 높음(2V – 15V) 또는 개방
위: OUT OFF = 높음(2V – 15V) 또는 개방, OUT ON = 낮음(0 – 0.6V) 또는 단락

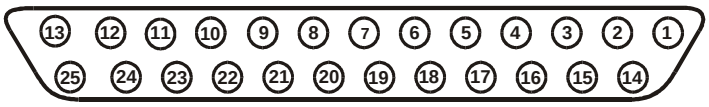
6 – 미사용

7 – 출력 전압, 저항 프로그래밍
아래: 전면 패널에서 출력 전압을 프로그래밍합니다.
위: 외부 저항기로 출력 전압을 프로그래밍합니다.

8 – 출력 전류, 저항 프로그래밍
아래: 전면 패널에서 출력 전류를 프로그래밍합니다.
위: 외부 저항기로 출력 전류를 프로그래밍합니다.

9 – 설정/해제 제어
아래: J1 설정+/설정– 핀이 활성이 아닙니다.
위: J1 설정+/설정– 핀이 활성입니다.

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 J1에 연결하지 않아도 됩니다.

핀 1:	**설정 입력**	핀 1 과 핀 14 를 연결하여 출력 설정(출력을 해제하려면 연결 해제)
핀 2, 3:	**섀시 공통**	핀 15 및 핀 16 에 대한 신호 반환(섀시에 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 참조)
핀 13:	**CV/CC**	정전압/정전류 모드 표시를 위한 출력
핀 14:	**설정 출력**	핀 1 과 핀 14 를 연결하여 출력 설정(출력을 해제하려면 연결 해제)
핀 15:	**차단**	출력의 차단 제어를 위한 입력(섀시 공통 참조)
핀 16:	**전원 공급기 OK**	전원 공급기 상태를 나타내는 출력(섀시 공통 참조)
핀 17-20:	**미사용**	연결 없음
핀 21:	**로컬/아날로그 상태**	로컬 또는 아날로그 프로그래밍 모드의 표시를 위한 출력
핀 22:	**전압 프로그램 반환**	핀 9 에 대한 신호 반환(핀 12 에 내부적으로 연결)
핀 23:	**전류 프로그램 반환**	핀 10 에 대한 신호 반환(핀 12 참조)
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 등급1에 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

감전 위험 **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℃에 달하는 곳에서 전원 공급기를 사용하지 마십시오.

팬은 전면에서 공기를 흡입하고 후면에서 배출시켜 전원 공급기를 냉각시킵니다. 적합한 통풍을 위해 장치 전면 및 후면에 적어도 10cm(4인치)의 충분한 공간을 두고 장비를 설치해야 합니다.

랙 장착

Keysight N8700 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 Keysight 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

감전 위험 **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

감전 위험

감전 위험! 전원 케이블의 접지 컨덕터가 섀시 접지로 사용됩니다. 전원 케이블의 접지 컨덕터가 전원과 기기 AC 입력 커넥터에 연결되어 있는지 확인하십시오.

화재 위험! 기기와 함께 제공된 전원 케이블만 사용하십시오. 다른 종류의 전원 케이블을 사용하면 전원 케이블이 과열되어 화재가 발생할 수 있습니다.

감전 위험

AC 전원에 연결! 전원 공급기는 다음과 같은 정격의 회로 차단기 또는 퓨즈 등과 같은 보호 장치를 통해 AC 전원에 연결해야 합니다.
단상 모델의 경우: 위상당 최대 30A
3 상 모델의 경우: 위상당 최대 20A

주의

현지 전기 법률에 따라 인가된 전기 기사가 AC 전원에 3.3kW 또는 5kW 전원 공급기를 연결해야 합니다.

전원 on/off 스위치는 기본 연결 해제 장치가 아니므로 AC 전원으로부터 모든 회로의 연결이 완전히 해제되지 않습니다. 영구 및 다상 구성을 위해 스위치 또는 회로 차단기 등의 연결 해제 장치는 최종 설치에 제공되어야 합니다.

연결 해제 장치는 UL/CSA/EN 61010-1 요구사항을 준수해야 합니다. 이 장치는 장비에 근접해야 하며 쉽게 액세스가 가능하며 이 장비의 연결 해제 장치로 표시되어야 합니다. 연결 해제 장치는 각 장치 상단 커버에 있는 INPUT RATING 레이블에 표시된 입력 정격 요구사항을 충족해야 합니다.

다음과 같은 종단 처리되지 않은 전원 케이블 중의 하나에 각 장치를 제공합니다. 필요한 경우 적절한 잠금형 전원 플러그를 전원 케이블의 끝에 연결하십시오.

케이블 옵션/부품 번호	설명	정격	와이어 크기	길이	승인
OPT 831, p/n 8121-1949	3.3kW 단상	300V, 25A, 60°C	3 x 10AWG 참고 1,3	2.5m	UL/CSA
OPT 832, p/n 8121-1331	3.3kW 단상	250V, 32A, 60°C	3 x 4mm^2 참고 1	2.5m	Harmonized
OPT 861, p/n 8121-1946	3.3kW/5kW 3 상 (190-240VAC)	300V, 25A, 90°C	4 x 10AWG 참고 2,3	2.5m	UL/CSA
OPT 862, p/n 8121-1948	3.3kW/5kW 3 상 (380-415VAC)	450V, 20A, 70°C	4 x 2.5mm^2 참고 2	2.5m	Harmonized

참고 1: 2 와이어와 하나의 녹색/노랑 안전 접지 컨덕터

참고 2: 3 와이어와 하나의 녹색/노랑 안전 접지 컨덕터

참고 3: 10AWG 는 4mm^2 에 해당

3.3kW 및 5kW 장치의 입력 연결

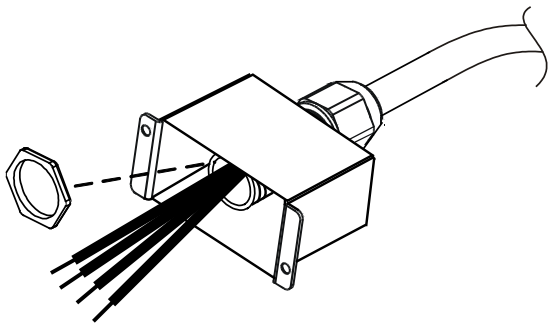
AC 입력 커넥터는 후면 패널에 있습니다. 3.3kW 단상 장치용 3단자 와이어 클램프 또는 3.3kW 및 5kW 3단상 장치용 4단자 와이어 클램프입니다. 입력 전압 및 전류 정격은 아래와 같습니다.

장치	AC 입력	100% 로드 시 입력 전류	주파수
3.3kW 단상	190 – 240VAC	최대 23 – 24A	50/60Hz
3.3kW 3 상	190 – 240VAC 380 – 415VAC	최대 13.6 – 14.5A 최대 6.8 – 7.2A	50/60Hz 50/60Hz
5kW 3 상	190 – 240VAC 380 – 415VAC	최대 21 – 22A 최대 10.5 – 12A	50/60Hz 50/60Hz

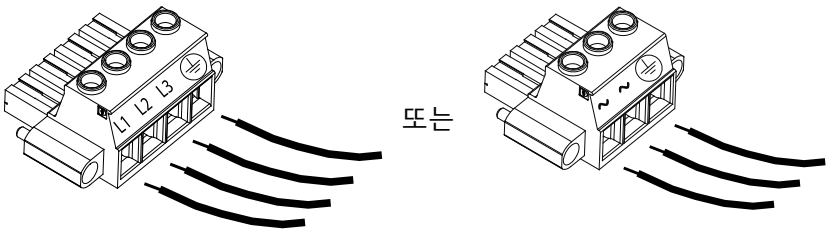
참고 **장치의 라인 전압 정격은 변경할 수 없습니다. 라인 전압 정격이 AC 전원과 일치하지 않을 경우 수정을 위해 장치를 공장으로 반품해야 합니다.**

다음과 같이 케이블을 AC 입력 커넥터에 연결합니다.

1. AC 케이블의 절연 피복을 약 10cm(4인치) 벗겨냅니다. 녹색/노랑 접지 와이어가 다른 와이어보다 10mm(0.4인치) 길게 나오도록 와이어를 정리합니다. 각 와이어 끝을 10mm(0.4인치) 벗겨냅니다.
2. 와이어 압축 너트에서 응력 완화 베이스를 풉니다. AC 입력 커버 내부의 잠금 너트를 너트의 납작한 쪽이 커버의 반대에 위치하도록 장착합니다. AC 입력 커버의 외부 입구를 통해 베이스를 끼웁니다. 베이스를 외부에서 잠금 너트에 단단히 고정합니다. 조임 토크는 17ft-lb(23Nm)입니다.
3. 와이어 압축 너트를 AC 케이블에 밀어 넣습니다. 벗겨낸 와이어를 피복 부분이 베이스 가장자리까지 올 때까지 응력 완화 베이스에 집어넣습니다. 렌치를 사용해 베이스가 돌아가지 않게 합니다. 이제 케이블이 움직이지 않도록 하면서 압축 너트를 베이스에 고정시킵니다. 조임 토크는 14 – 16.2ft-lb(19 – 22Nm)입니다. 다음 그림을 참조하십시오.

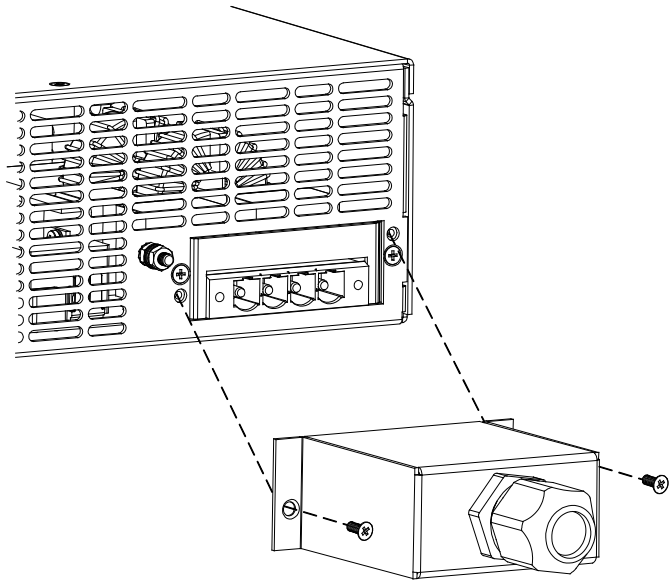


4 필요에 따라 AC 와이어를 입력 커넥터 단자에 연결합니다. 와이어를 연결하려면 다음 그림에 표시된 것처럼 단자 나사를 풀고 피복을 벗긴 와이어를 단자에 넣은 다음 나사를 단단히 조입니다. 녹색/노랑 접지 컨덕터가 커넥터의 접지 단자에 연결되어 있는지 확인합니다. 커넥터를 후면 패널 헤더에 꽂고 측면 나사로 고정합니다. 나사 조임 토크는 10.7 – 13.4in-lb(1.2 – 1.5Nm)입니다.



플러그 유형:	PC 6/4-STF-10,16 또는 PC 6/3-STF-10,16 Phoenix
와이어 크기:	AWG 18 ~ AWG 8
피복 제거 길이:	12mm(0.5 인치)
토크:	10.7 – 13.4in-lb(1.2 – 1.5Nm)

5 장착을 위해 커버를 후면 패널쪽으로 밀어 넣으면서 와이어를 커버 내부로 집어넣어 끼이지 않도록 합니다. 제공된 M3 x 8mm 납작 머리 나사로 커버를 장치에 고정시킵니다. 나사 조임 토크는 4.8in-lb(0.54Nm)입니다. 다음 그림을 참조하십시오.



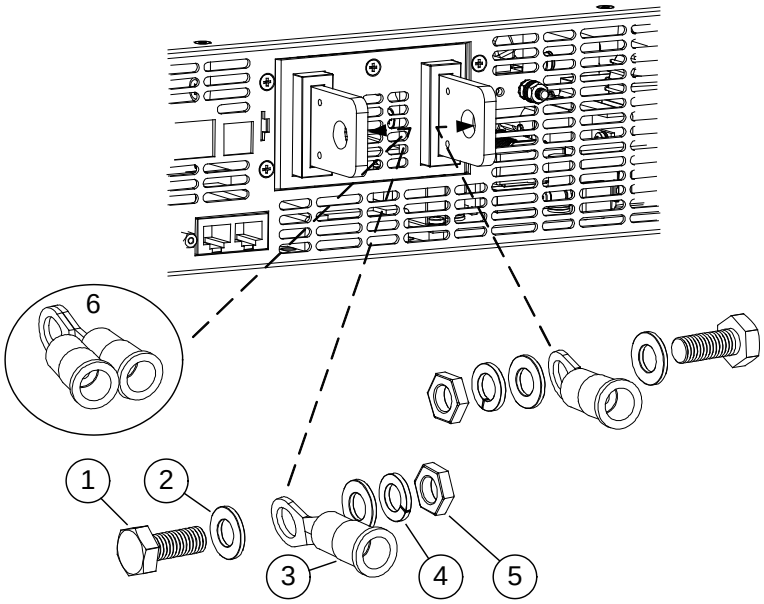
로드 연결(8V ~ 100V 모델)

감전 위험 **감전 위험! 후면 패널에서 연결 작업을 시작하기 전에 AC 전원을 차단하십시오. 모든 와이어와 스트랩은 나사를 완전히 조여 올바로 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.

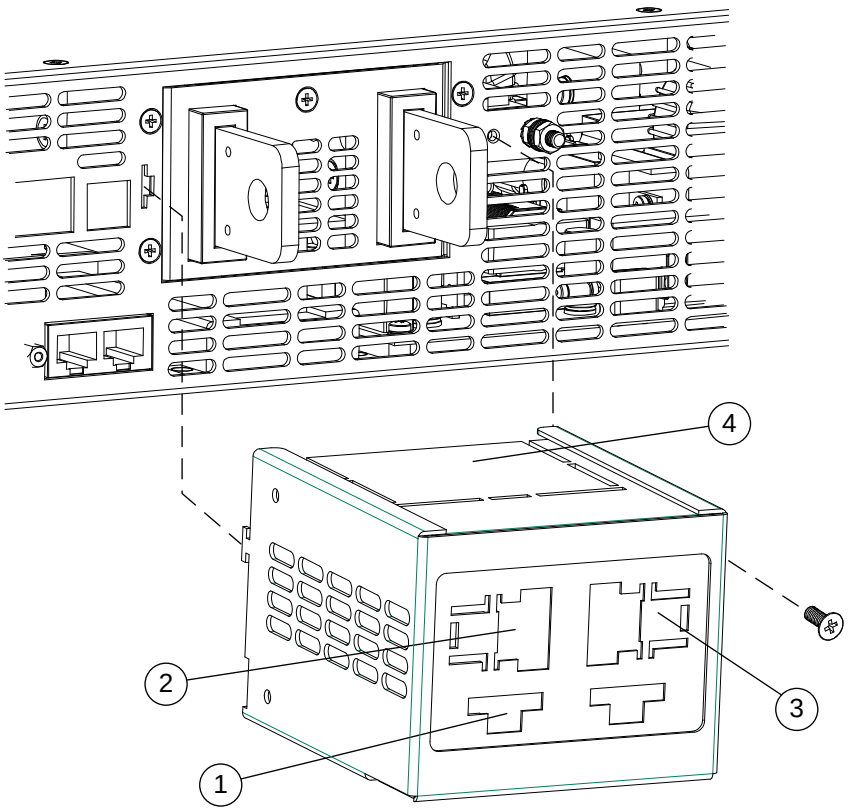
주의 장착 철재 부속품이 출력 단자와 접촉되지 않도록 하십시오. 무거운 연결 케이블에는 특정 형태의 응력 완화를 사용하여 연결이 헐거워지거나 버스 막대가 휘지 않도록 해야 합니다.

1 다음 그림에 나타낸 것처럼 모든 로드 와이어는 단자를 단단히 부착하여 적합하게 종단 처리해야 합니다. 종단 처리되지 않은 와이어를 전원 공급기의 로드 연결에 사용하지 마십시오. 와이어 단자를 버스 바 *내부*에 부착하여 덮개 설치 공간을 충분히 확보합니다.



1 – 나사 **2 – 납작 워셔** **3 – 와이어 단자 러그**
4 – 스프링 워셔 **5 – 너트** **6 – 병렬 러그**

2 로드 와이어 연결이 끝났으면 보호 덮개를 덮습니다. 필요한 경우 다음 그림에 표시된 것처럼 크기가 더 큰 와이어에 적합한 컷아웃을 제거합니다. 왼쪽의 탭과 오른쪽의 M3 x 8mm 납작 헤드 나사를 사용해 덮개를 고정합니다. 나사 조임 토크는 4.8 - 5.3in-lb(0.54 – 0.6Nm)입니다.



1 – 크기가 AWG 4 – 10 인 와이어의 입구.
2 – 크기가 AWG 2 – 1/0 인 와이어의 입구. 작은 컷아웃은 제거됩니다.
3 – 크기가 AWG 2/0 – 3/0 인 와이어에 이 컷아웃을 제거합니다.
4 – 버스 레일 설치를 위해 이 컷아웃을 제거합니다.

로드 연결(150V, 300V 및 600V 모델)

감전 위험

감전 위험! 후면 패널에서 연결 작업을 시작하기 전에 AC 전원을 차단하십시오. 모든 와이어와 스트랩은 나사를 완전히 조여 올바로 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.

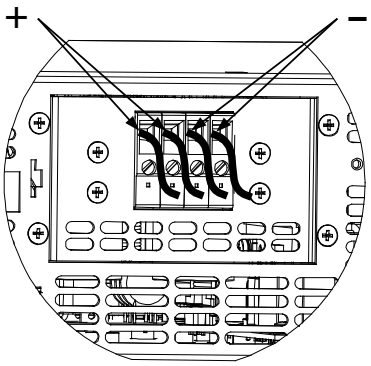
150V, 300V 및 600V 모델에는 4개의 단자 와이어 클램프 출력 커넥터가 있습니다. 왼쪽 2개의 단자는 양극 출력이고 오른쪽 2개의 단자는 음극 출력입니다. 커넥터 규격은 다음과 같습니다.

와이어 크기:	AWG 18 ~ AWG 10
피복 제거 길이:	10mm(0.4 인치)
토크:	4.4 – 5.3in-lb(0.5 – 0.6Nm)

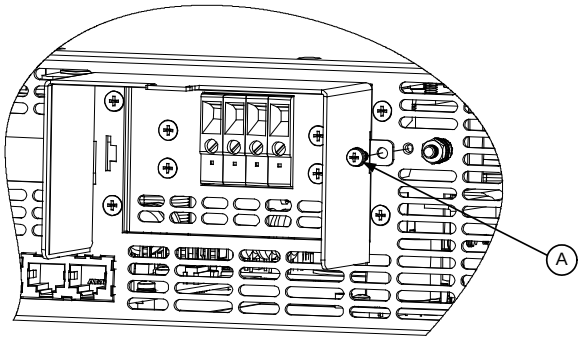
로드 와이어를 다음과 같이 전원 공급기 출력 와이어 클램프 커넥터에 연결합니다.

1 와이어를 약 10mm(0.4인치) 벗겨냅니다.

2 커넥터 단자 나사를 풀고 벗겨낸 와이어를 단자에 넣습니다. 단자 나사를 단단히 조입니다.



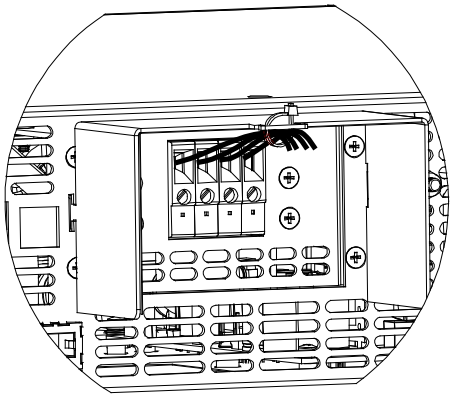
3 A 표시가 있는 섀시 나사를 풀어 제거(저장)합니다.



4 보호 덮개 왼쪽의 슬롯이 있는 탭을 섀시 슬롯에 밀어 넣어 고정합니다. 이전에 제거한 왼쪽 덮개 나사를 끼워 섀시에 덮개를 고정합니다. 나사 조임 토크는 4.8 - 5.3in-lb(0.54 – 0.6Nm)입니다.

5 로드 와이어를 덮개 상단의 탭에 집어넣습니다. 응력이 적당히 완화되도록 덮개 내부의 와이어 길이를 충분히 길게 하십시오.

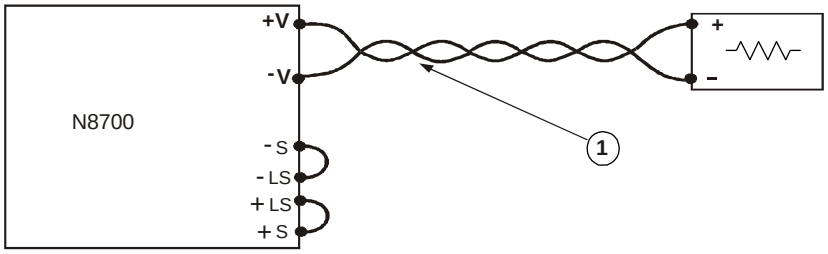
6 아래 그림에 표시된 것처럼 로드 와이어를 타이-랩 또는 이와 유사한 것을 사용해 노치가 있는 덮개 탭에 부착합니다.



출력 전압 감지

로컬 감지

전원 공급기는 출력 전압을 로컬로 감지하기 위해 후면 패널 J2 감지 커넥터가 배선된 상태에서 출고됩니다(9페이지 참조). 로컬 감지의 경우 출력 전압은 출력 단자에서 조절됩니다. 원격 감지는 로드 전류가 낮은 경우나 로드 조절이 덜 중요한 경우에만 권장합니다.

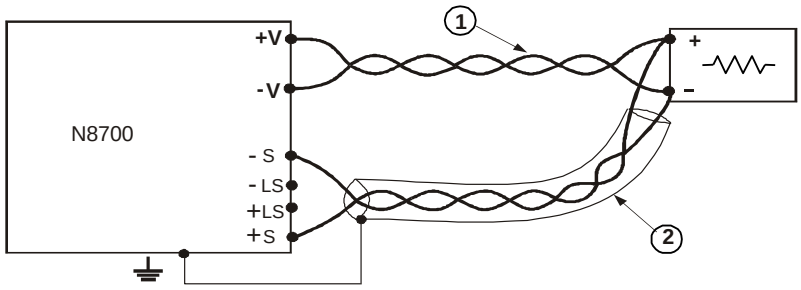


1 – 로드 라인 = 꼬임 쌍선 , 가능한 가장 짧은 길이

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 섀시나 로드 접지 중 한 지점에 접지시켜야 합니다.



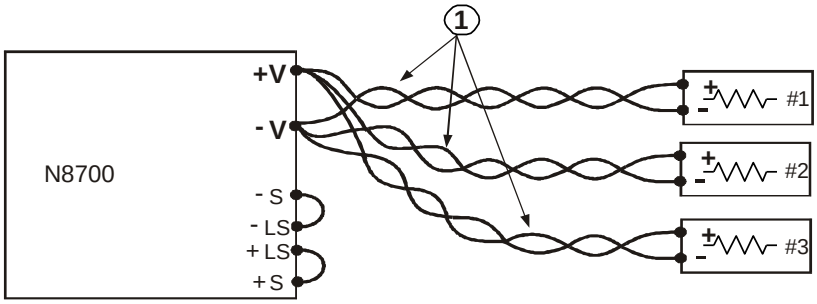
1 – 로드 라인 = 꼬임 쌍선, 가능한 가장 짧은 길이

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.

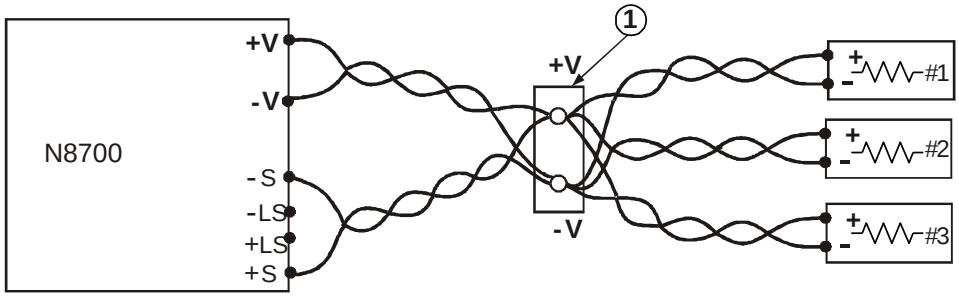


1 – 로드 라인 = 꼬임 쌍선, 가능한 가장 짧은 길이

다음 그림에 나타낸 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 섀시 접지에 가깝게 접지 시키십시오. 경고

감전 위험

감전 위험!

최대 60VDC 정격 출력 모델의 경우 출력의 어떤 지점도 섀시 접지의 ±60VDC 이상 또는 이하여서는 안 됩니다.

60VDC 이상의 정격 출력 모델인 경우 양극 출력의 어떤 지점도 섀시 접지의 ±600VDC 이상 또는 이하여서는 안 됩니다.

60VDC 이상의 정격 출력 모델인 경우 음극 출력의 어떤 지점도 섀시 접지의 ±400VDC 이상 또는 이하여서는 안 됩니다.

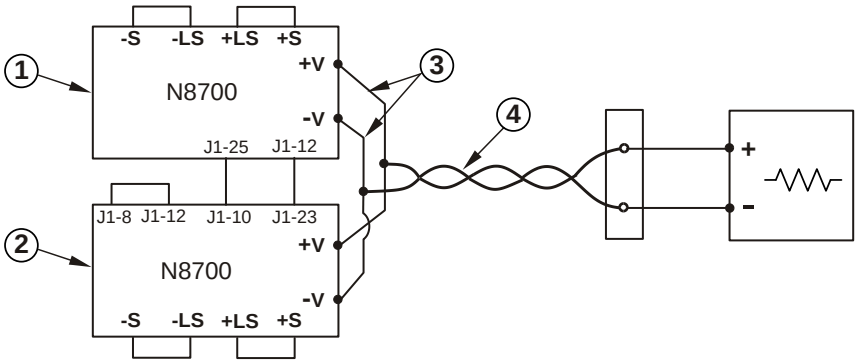
병렬 연결

주의

정격 전압 및 전류가 동일한 전원 공급기만 병렬로 연결할 수 있습니다.

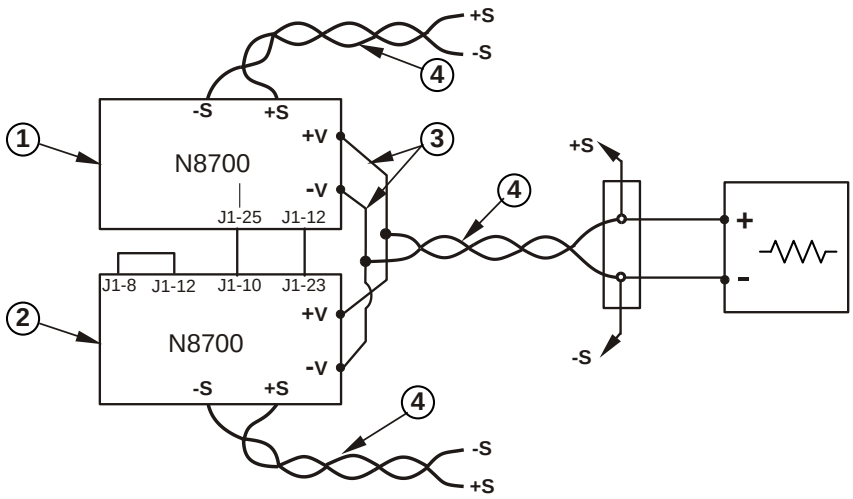
같은 정격 전압 및 전류의 전원 공급기 4대를 병렬로 연결하여 최대 4배의 출력 전류를 얻을 수 있습니다. 다음 그림에는 두 대의 장치를 나타내었지만 최대 4대까지 동일한 연결 방법이 적용됩니다.

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 위치2를 위로 설정합니다. 슬레이브 장치의 J1 핀10(전류 프로그램)을 마스터 장치의 J1 핀25(병렬)에 연결합니다. 슬레이브 장치의 J1 핀23 (전류 프로그램반환)을 마스터 장치의 J1 핀12 (공통)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

감전 위험 **감전 위험!**

최대 60VDC 정격 출력 모델의 경우 출력의 어떤 지점도 섀시 접지의 ±60VDC 이상 또는 이하여서는 안 됩니다.

60VDC 이상의 정격 출력 모델인 경우 양극 출력의 어떤 지점도 섀시 접지의 ±600VDC 이상 또는 이하여서는 안 됩니다.

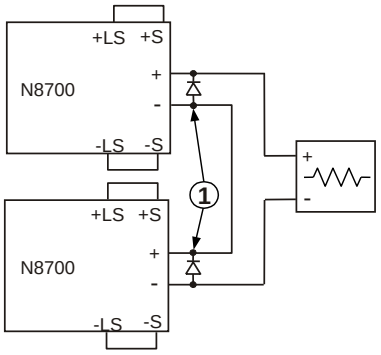
60VDC 이상의 정격 출력 모델인 경우 음극 출력의 어떤 지점도 섀시 접지의 ±400VDC 이상 또는 이하여서는 안 됩니다.

주의 정격 전압 및 전류가 동일한 전원 공급기만 직렬로 연결할 수 있습니다.

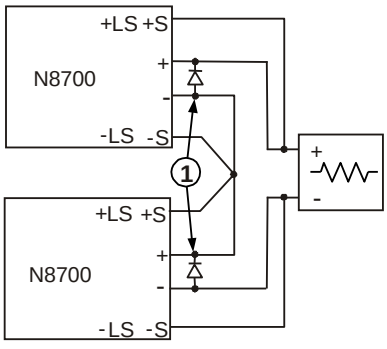
같은 정격 전압 및 전류의 전원 공급기 두 대를 직렬로 연결하여 최대 두 배의 출력 전압을 얻을 수 있습니다. 직렬 회로의 각 요소에서 흐르는 전류는 동일하기 때문에 직렬로 연결된 출력의 정격 전류는 동일해야 합니다.

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.

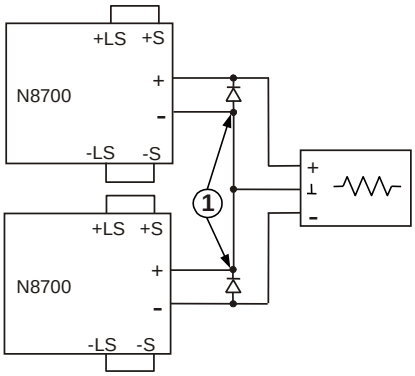
다음 그림은 로컬 및 원격 감지에서의 직렬 연결을 보여줍니다. 직렬 연결된 전원 공급기가 양극 및 음극 출력으로 구성된 것도 보여줍니다.



로컬 감지



원격 감지



양극 및 음극 출력

1 – 다이오드는 사용자가 제공합니다.

정상 작동

정전압 모드

정전압 모드에서 전원 공급기는 로드에 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 5초 동안 프로그래밍된 전압이 표시된 다음 OFF가 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 로드에 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 5초 동안 프로그래밍된 전류가 표시된 다음 실제 출력 전류가 표시됩니다.

출력이 해제되었을 때는 LIMIT 버튼을 누른 다음 전류 노브를 돌립니다. 조절을 마치면 DC AMPS 디스플레이에 5초 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. 로드가 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 핀12에서 공통을 참조하는 개방된 컬렉터 출력입니다. J1 핀12는 –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 OUP를 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(On) 또는 해제(Off)되어 있을 때 수행할 수 있습니다. UVL 레벨을 설정하려면 OVP/UVL 버튼을 두 번 눌러 디스플레이에 UUL을 표시합니다. 디스플레이에 UVL 설정이 표시됩니다. 전압 노브를 돌려 UVL 레벨을 조절합니다. 디스플레이에 다시 5초 동안 UUL과 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 O7P가 표시되고 PROT 표시기가 깜박입니다.

전면 패널 잠금

전면 패널 조작 스위치를 실수로 움직이지 않도록 잠글 수 있습니다. LIMIT 버튼을 누르고 있으면 전면 패널 잠금(LFP)과 전면 패널 잠금 해제(UFP) 사이에서 전환됩니다. 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 LFP가 표시되어 전면 패널이 잠겼음을 나타냅니다. OVP/UVL 버튼은 OVP와 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 0이 되고 디스플레이에 OFF가 표시됩니다.

출력 차단 단자

출력 차단(SO) 단자는 J1 커넥터에서 사용하여 전원 공급기 출력을 설정 또는 해제할 수 있습니다. 이 기능은 에지로 트리거됩니다. J1 핀15는 차단 입력이고 내부적으로 연결되는 핀2 및 핀3은 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 스위치5로 선택합니다.

차단 입력에서 켜기-끄기 전환이 감지되면 차단 기능이 J1 핀15에 인가된 신호 레벨이나 개방/단락에 따라 출력을 설정 또는 해제합니다. 차단 기능 으로 출력이 해제되면 디스플레이에 SO가 표시되어 출력이 해제되었음을 나타냅니다.

SW1 스위치 5	SO 신호 레벨	출력	디스플레이
아래(기본값)	2 – 15V 또는 개방	켜짐	전압/전류
	0 – 0.4V 또는 단락	꺼짐	SO
위	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 핀1 및 핀14 간에 간단히 스위치나 릴레이를 연결하십시오. 이 기능은 SW1 설정 스위치9로 활성화됩니다.

이 핀은 개방되었을 때 출력을 해제합니다. 출력이 해제되면 전면 패널의 PROT 표시기가 깜박입니다.

SW1 스위치 9	ENA+/ENA– 핀	출력	디스플레이	Prot 표시기
아래(기본값)	비활성	켜짐	전압/전류	꺼짐
위	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 핀16은 TTL 출력 신호입니다. 내부적으로 연결되는 핀2 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
- 과전류 보호
- 과열 보호
- AC 라인 장애
- 설정/해제 신호 참
- 차단 신호 참
- 인터페이스 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.

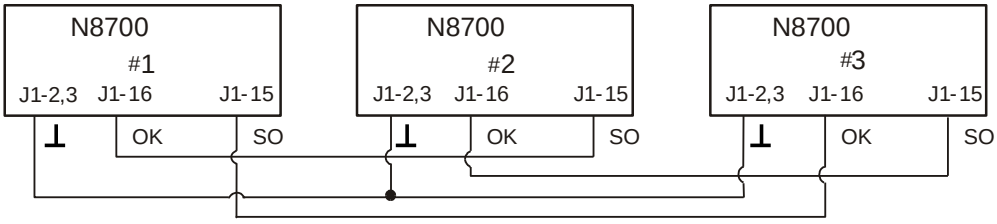
자동 재시작 모드에서는 전원 공급기가 마지막 껐을 때 저장된 작동 설정을 복원합니다(다음 목록 참조). 마지막 설정에 따라 출력이 설정 또는 해제됩니다.

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 스위치5가 아래 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 핀8은 TTL 신호나 개방/단락 접점 스위치(핀12 참조)를 받아들여 출력 전압 및 전류의 로컬 또는 아날로그 프로그래밍 중에서 선택합니다. 이 기능은 SW1 설정 스위치1 및 2로 설정 또는 해제합니다.

J1 커넥터 핀21은 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 아래(기본값)	효과 없음	개방	로컬
둘 중 하나 또는 모두 위	0 또는 단락	0~0.6V	아놀로그
	1 또는 개방	개방	로컬

출력 전압 및 전류의 전압 프로그래밍

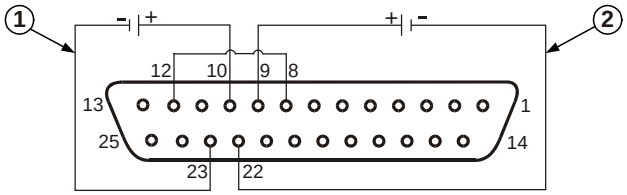
주의 J1 핀 12, 핀 22 및 핀 23 은 음극 감지 단자에 내부적으로 연결됩니다. 이 핀을 음극 감지 단자 이외에 어떤 단자에도 참조시키지 마십시오. 장치가 손상될 수 있습니다.

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 0에서 전체 범위까지 프로그래밍할 수 있습니다. 다음 표에 따라 SW1 설정 스위치3을 설정하여 프로그래밍 전압 범위를 선택합니다. SW1 설정 스위치1 및 2는 위 위치로 설정하고 스위치7 및 8은아래로 설정합니다.

SW1 스위치 3	전압 프로그램(J1 핀 9)	전류 프로그램(J1 핀 10)
아래(기본값)	0 –5V	0 –5V
위	0 – 10V	0 – 10V

다음 그림에 나타낸 것처럼 프로그래밍 소스를 J1의 결합 플러그에 연결합니다. 전압 소스에 올바른 극성을 지키십시오. 또한 J1 핀8 및 J1 핀12간에 단락을 연결합니다.



1 – 전류 한계 프로그래밍 **2 – 출력 전압 프로그래밍**

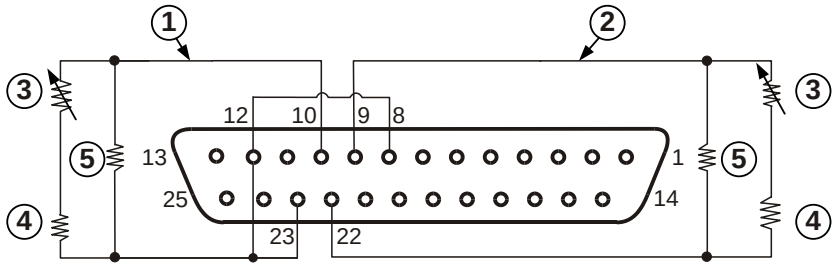
출력 전압 및 전류의 저항 프로그래밍

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 - 10kΩ의 저항을 선택하여 출력 전압 및 전류 한계를 0에서 전체 범위까지 프로그래밍할 수 있습니다. 온도 계수가 50ppm 이하인 안정적이고 노이즈가 적은 저항만 사용하십시오. 다음 표에 따라 SW1 설정 스위치3을 설정하여 프로그래밍 저항 범위를 선택합니다. SW1 설정 스위치 1, 2, 7 및 8을 모두 위 위치로 선택해야 합니다.

SW1 스위치 3	전압 프로그램(J1 핀 9)	전류 프로그램(J1 핀 10)
아래(기본값)	0 – 5kΩ	0 – 5kΩ
위	0 – 10kΩ	0 – 10kΩ

다음 그림에 나타낸 것처럼 프로그래밍 저항을 J1의 결합 플러그에 연결 합니다. 가변 저항을 사용하면 전범위에 걸쳐 출력을 조절할 수 있습니다. 가변 저항과 직렬 및 병렬 저항을 함께 사용하면 제한된 범위에 걸쳐 출력을 제어할 수 있습니다. 또한 J1 핀8 및 J1 핀12및 J1 핀23 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 줄지 않습니다.

SW1 스위치 4	전압 범위	J1 신호 연결	신호 기능
아래(기본값)	0 -5V	J1 핀 11	전압 모니터
		J1 핀 24	전류 모니터
위	0 – 10V	J1 핀 11	전압 모니터
		J1 핀 24	전류 모니터

J1 핀12는 J1 핀11 및 24에 대한 신호 공통입니다.

원격 인터페이스의 구성과 사용

Keysight N8700 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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