Model **1693, 1694**

Switching DC Power Supply

INSTRUCTION MANUAL

1 Safety Summary

The following safety precautions apply to both operating and maintenance personnel and must be observed during all phases of operation, service, and repair of this instrument. Before applying power, follow the installation instructions and become familiar with the operating instructions for this instrument.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. This instrument is grounded through the ground conductor of the supplied, three-conductor ac power cable. The power cable must be plugged into an approved three-conductor electrical outlet. Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Instrument covers must not be removed by operating personnel. Component replacement and internal adjustments must be made by qualified maintenance personnel. Disconnect the power cord before removing the instrument covers and replacing components. Under certain conditions, even with the power cable removed, dangerous voltages may exist. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt any internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY THE INSTRUMENT

Do not install substitute parts or perform any unauthorized modifications to this instrument. Return the instrument to B&K Precision for service and repair to ensure that safety features are maintained.

WARNINGS AND CAUTIONS

WARNING and ***CAUTION*** statements, such as the following examples, denote a hazard and appear throughout this manual. Follow all instructions contained in these statements.

A ***WARNING*** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A ***CAUTION*** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

WARNING: ***Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.***

WARNING: ***To avoid electrical shock hazard, disconnect power cord before removing covers. Refer servicing to qualified personnel.***

CAUTION: ***Before connecting the line cord to the AC mains, check the rear panel AC line voltage indicator. Applying a line voltage other than the indicated voltage can destroy the AC line fuses. For continued fire protection, replace fuses only with those of the specified voltage and current ratings.***

CAUTION: ***This product uses components which can be damaged by electro-static discharge (ESD). To avoid damage, be sure to follow proper procedures for handling, storing and transporting parts and subassemblies which contain ESD-sensitive components.***

SAFETY SYMBOLS

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

Certification

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

Compliance Statements

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems)

This product is subject to Directive 2002/96/EC of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

Contents

2 Introduction

B&K Precision models 1693 and 1694 switching mode DC power supplies provide high current output in a lightweight and compact package. It is suitable for a variety of uses, especially for powering DC operated mobile radio equipment on the bench. These 900W power supplies provide a variable voltage output from 1 V to 15 V at 60 A (model 1693) or from 1 V to 30 V at 30 A (model 1694). In addition, a remote sensing terminal is available for use to compensate for voltage drops due to resistances from load leads. The output voltage level can also be externally controlled via an analog remote control terminal. Switching mode power supplies have the advantage of being lightweight and high in efficiency when compared to traditional linear mode power supplies. The efficiency can exceed 85% under optimal conditions. Bright 3-digit LED displays give an accurate and highly readable indication of settings.

Features

- Up to 60 A output current
- Lightweight and compact
- Dual 3-digit LED displays
- Remote sense terminal
- Analog remote control via external voltage source or variable resistor
- Current foldback circuitry with illuminated indicator prevents overloading the power supply
- Overtemperature protection circuitry
- Overvoltage protection
- Front panel auxiliary output

3 Installation

3.1 Initial Inspection

This unit is tested prior to shipment. It is therefore ready for immediate use upon receipt. The initial physical inspections should be made to ensure that no damage has been sustained during shipment.

Inspect the packing box on receipt for any external damage. If any external damage is evident, remove the instrument and visually inspect its case and parts for any damage. If damage to the instrument is evident, a description of the damage should be noted on the carrier's receipt and signed by the driver or carrier agent. Save all shipping packaging for inspection. Forward a report of any damage to the agent through which the unit is procured.

Retain the original packing in case subsequent repackaging for return is required. Use of the original packing is essential.

After the mechanical inspection, verify the contents of the shipment. The items included with the instrument are:

- Power cord
- Instruction manual
- Remote control connector

If the contents are incomplete, or if the instrument does not pass the specification acceptance tests, notify the local service center.

3.2 Input Power Requirements

The power supply has a universal input and can operate in any country that uses a mains voltage within 100-240 VAC, 50Hz/60Hz.

4 Controls and Indicators

4.1 Front Panel

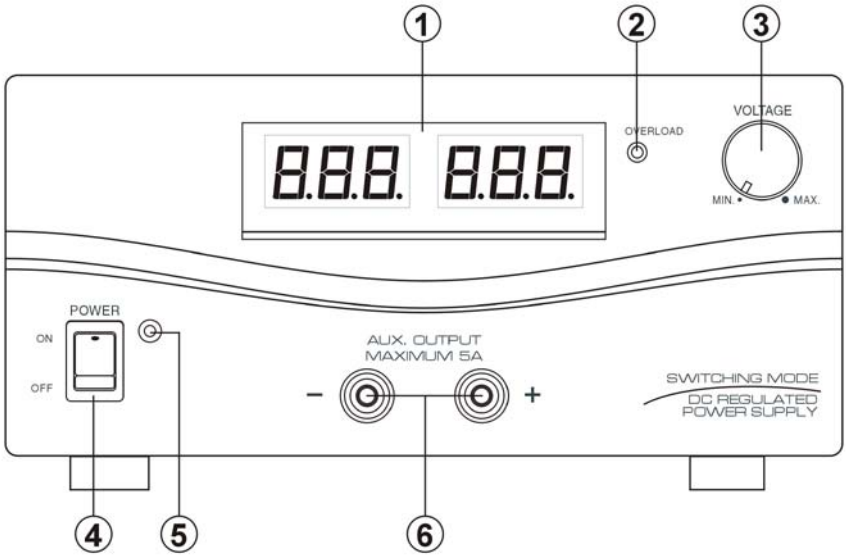

Figure 1 - Front Panel

(1) Voltage and Ammeter LED Display

(2) Overload LED Indicator – Overload (Constant Current Limiting) and Short-Circuit Protection

(3) Output Voltage Control Knob – Control Both Main and Auxiliary Output

(4) Power ON/OFF Switch

(5) Power ON/OFF LED

(6) Auxiliary Output Terminal (max 5 A for 1693, max 3 A for 1694)

Note: Please see Section 5.2 for more details on using both main and auxiliary output terminals together.

4.2 Rear Panel

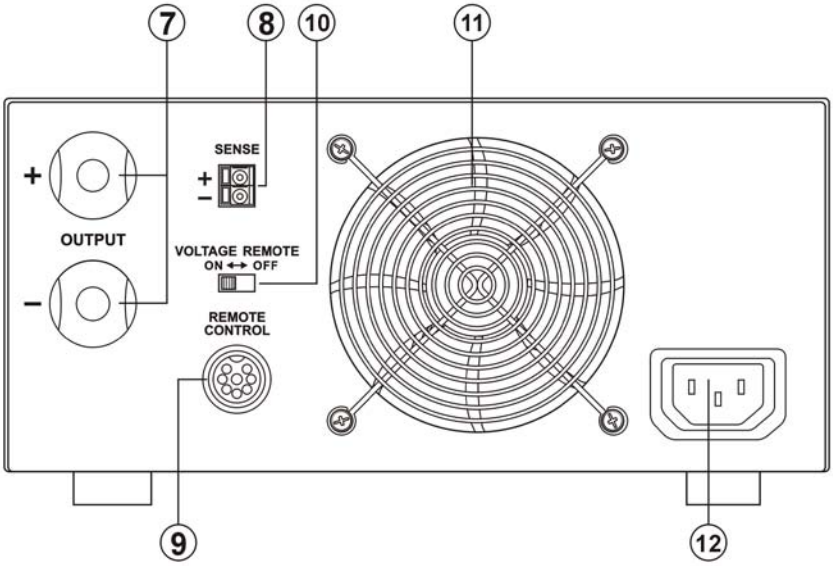

Figure 2 - Rear Panel

(7) Main Output Terminal (rated 60 A for 1693 / 30 A for 1694)

Note: Please see Section 5.2 for more details on using both main and auxiliary output terminals together.

(8) Remote Sensing Terminal

(9) Analog Remote Control Terminal

(10) Analog Remote Control ON/OFF Switch

(11) Cooling Fan Air Intake Grille

(12) AC Input Plug

5 Operating Instructions

Safety Precautions

- Never short the remote sensing terminal.
- This power supply is for indoor use only.
- Do not expose the power supply to sun, high humidity, or dusty environments.
- Never remove the metal cover of the power supply while AC power is connected.
- Never touch the unit when your hands are wet.
- Never block the ventilation slots and cooling fan air intake window.
- Never attempt to repair the power supply. Incorrect reassembly may result in a risk of electric shock or fire.
- Never use the power supply for a load requiring higher current than the designed value, otherwise it may damage the power supply.
- Place the power supply on a flat surface with sufficient clearance and dry, dust-free surroundings for ventilation.

This series has two models with different output voltage range and current. Make sure you have purchased the correct one.

Model Number	Output Voltage Range	Total Rated Current
1693	1 – 15 V	60 A
1694	1 – 30 V	30 A

Table 1 - Models

5.1 Instrument Hook-Up

1. Check the rating label of the power supply and make sure it complies with your AC mains voltage. Connect the power supply to the AC mains using the provided power cord.

   CAUTION: The AC input is double pole fusing.

2. If you do not use the analog remote control feature, make sure the remote control ON/OFF switch on the rear panel is in the OFF position. For analog remote control procedures, please refer to Section 5.4.

3. Switch on the power supply and the power ON/OFF LED should light up in green. Then, adjust the output voltage to the desired voltage and switch off the power supply.

4. If you are using remote sense, connect as described in Section 5.3. Otherwise, skip to the next step.

5. Connect the positive polarity of the device being powered to the red (+) terminal of the power supply.

6. Connect the negative polarity of the device being powered to the black (-) terminal of the power supply.

7. Switch on the power supply first and the LED indicator should light up in green.

8. Switch on the equipment and the LED indicator should still remain green.

9. You can now operate the equipment. When an operation is finished, switch off the equipment first and then switch off the power supply.

10. When disconnecting the power supply from the unit, disconnect the remote sensing wire first, and then disconnect the output cables.

Note: Steps 2 and 4 explain how to use the special features – analog remote control and remote sense. You can use both features at the same time or separately.

5.2 Using Both Main and Auxiliary Outputs

The 1693 and 1694 both have a main and auxiliary output that can be used separately or together.

The voltage control knob will adjust the output voltage for both of these output terminals and they will output the same voltage. When using both the main and auxiliary outputs together, the power supply will automatically total the currents supplied to both terminals up to the current limit of the power supply and show the total current on the display.

For example, setting the voltage output for model 1693 (1-15 V, 0-60 A) to 15 V would output 15 V at both the main and auxiliary terminals. A total of 60 A can be drawn between the two terminals. If there is a 5 A load at the auxiliary terminal, the most current you can draw from the main output is 55 A.

If the power supply exceeds its maximum rated current at any time, the overload LED will light.

Note: 1693 - Total rated current (Aux. + Main) is 60 A
1694 - Total rated current (Aux. + Main) is 30 A

5.3 Remote Sensing

WARNING: Never short the remote sensing terminal.

Never connect the remote sensing terminal in reverse polarity.

Always disconnect the remote sensing terminal first.

The 1693 and 1694 both provide a remote sensing terminal to help compensate for voltage drops due to load leads.

5.3.1 Connection

1. Make the power connections between power supply and equipment.

2. Check and make sure the power connections are secure.

3. Then make connections between Remote Sensing and equipment.

Figure 3 shows typical connection between power supply and device for remote sense operation.

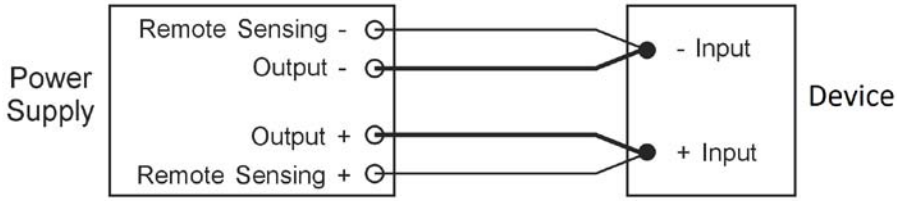

Figure 3 - Remote Sense Connection

The remote sensing wire should be at least 22AWG wire size.

5.3.2 Disconnection

WARNING: Wrong disconnect sequence will damage the power supply.

1. Disconnect the remote sensing connections.

2. Disconnect the power connections between the power supply and equipment.

5.4 Remote Control

5.4.1 Voltage Remote Control

Set up the provided remote connector plug.

(a) Remove the pin plug of the remote control connector plug by removing the screw as shown in Figure 4.

Figure 4 - Remote Control Connector

(b) Solder 3 wires (22AWG) to pins 1, 2, and 3 of pin plug as shown in Figure 5.

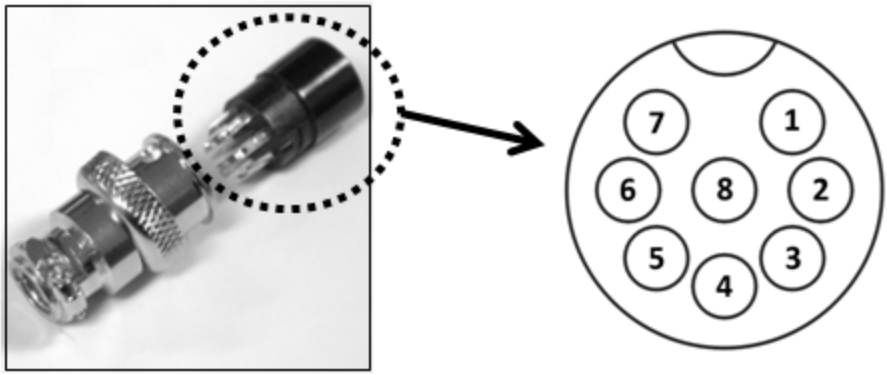

Figure 5 - Pin Numbers

(c) **Make sure the load is disconnected and the power supply is OFF before continuing to the next step. Otherwise, power supply may be damaged.**

(d) Plug the remote connector plug into the remote control terminal of the power supply.

(e) Secure the remote connector plug to the terminal socket by locking connector ring (Figure 6).

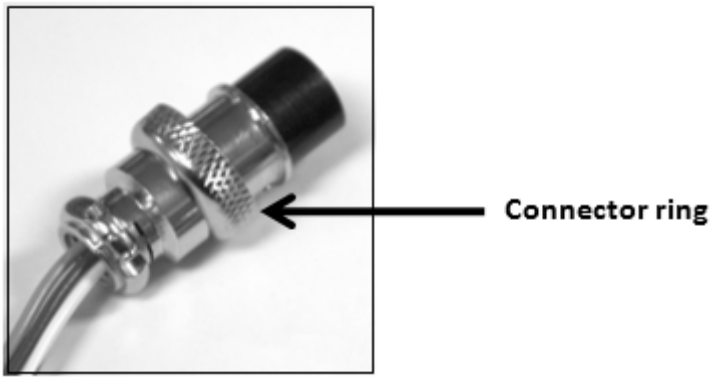

Figure 6 - Connector Ring

Then, you can choose either method A or B below to use the analog remote control feature.

Method A: Using an External Variable DC Voltage Source

A variable external voltage source of 0 to 5 V is fed into the analog remote control terminal to adjust the output voltage level of both Main and Auxiliary outputs.

WARNING: Do not input higher than 5 V, otherwise the overvoltage protection (OVP) will be triggered.

1. **Make sure the load is disconnected and the power supply is OFF.**
2. Only use wires from pins 2 and 3. Connect pin 2 to positive polarity of the external voltage source and pin 3 to negative polarity of the external voltage source.
3. Turn the remote control ON/OFF switch to ON position.
4. Switch on the power supply.
5. Vary the external input voltage from 0 to 5 V to check and verify the full output voltage range of the power supply.
6. Switch off the power supply.

Method B: Using a 5 kΩ Variable Resistor

1. Make sure the load is disconnected and the power supply is OFF.
2. Prepare a 5 kΩ variable resistor and connect wires from pins 1, 2, and 3 as shown in Figure 7.

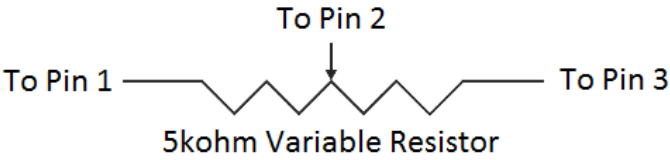

Figure 7 - Variable Resistor Connection

3. Turn the remote control ON/OFF switch to ON position.
4. Switch on the power supply.
5. Adjust the 5 kΩ variable resistor from one end to the other to check and verify the full output voltage range of the power supply.
6. Switch off the power supply.

5.4.2 Enable and Disable the Output

You can use pins 7 and 8 to remotely control the OUTPUT ON/OFF.

a) Open pins 7 and 8 if you want to ENABLE the output (by default).

b) Short pins 7 and 8 if you want to DISABLE the output.

6 Maintenance

6.1 When the Unit is Not Turning On

Check if the power ON/OFF switch is turned ON. If not, then check the power cord. Please make sure that the power cord is properly connected to the unit. Please also check the main switch and ensure that the AC supply at your site is the same as the one mentioned at the rear chassis of the unit. Check for a blown fuse.

6.2 Fuse Replacement

If the fuse blows, the LED will not light and the instrument will not operate. Replace only with the correct value fuse. Refer to table below for fuse value and type. There are two identical fuses located internally on a PCB near the power input receptacle.

Line Voltage	Fuse	Type
100 – 240 VAC	20 A/250 V	3AB ceramic tube fast blow

Table 2 - Fuse Table

CAUTION: Never remove the metal cover of the power supply while AC power is connected.

Replace fuses as follows:

1. Unplug the power cord from the rear of the instrument.
2. Use a screwdriver to remove case cover of power supply.
3. Locate PCB near the power input receptacle where the fuses are clipped in (designated as F1 and F2) and replace blown fuses.

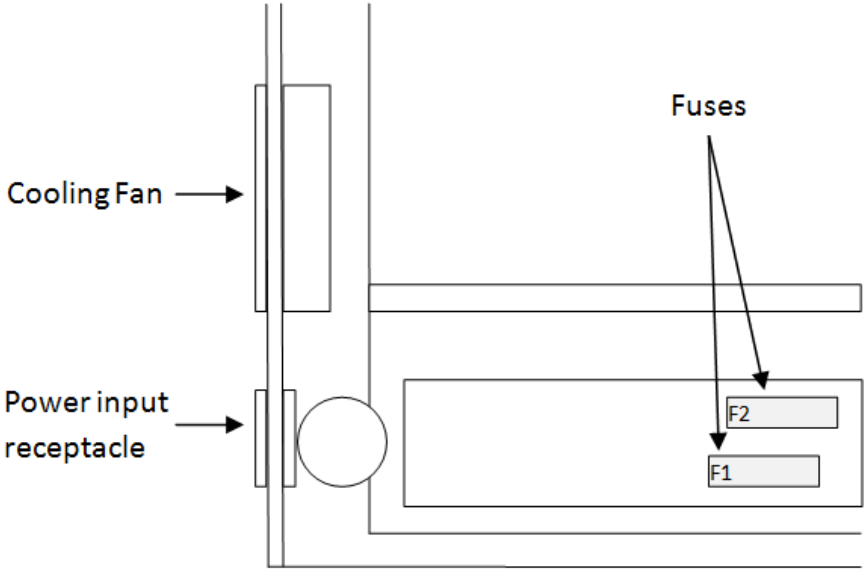

Figure 8 - Fuse Location

6.3 Instrument Repair Service

Because of the specialized skills and test equipment required for instrument repair and calibration, many customers prefer to rely upon B&K Precision for this service. We maintain a network of B&K Precision authorized service agencies for this purpose. To use this service, even if the instrument is no longer under warranty, follow the instructions given in the Warranty Service section of this manual. There is a nominal charge for instruments out of warranty.

7 Specifications

	1693	1694
Output		
Variable Output Voltage	1-15 V	1-30 V
Rated Main Output Current	60 A	30 A
Rated Auxiliary Output Current	5 A	3 A
Ripple and Noise	40 mVpp	
Load Regulation	0.1% + 5 mV	
Line Regulation	0.05% + 3 mV	
Meter Type & Accuracy		
Voltmeter	3-digit LED display ± 1% + 1 count	
Ammeter	3-digit LED display ± 1% + 1 count	
Other		
Input Voltage	100-240 VAC, 50 Hz/60 Hz	
Dynamic Power Factor Correction	> 0.97 at optimal load	
Efficiency	> 85%	
Cooling Method	Variable speed thermostatically controlled fan	

	1693	1694
Protections	Overload (Constant Current Limiting), Short Circuit, OTP (Overtemperature Protection), and OVP (Overvoltage Protection)	
Special Features	Remote control and remote sensing	
Operating Temperature	32 °F to 104 °F (0 °C to 40 °C) ≤ 80% R.H.	
Storage Temperature	5 °F to 158 °F (-15 °C to 70 °C) ≤ 85% R.H.	
Dimension (W x H x D)	8.66” x 4.33” x 14.17” (220 x 110 x 360 mm)	
Weight	12.8 lbs (5.8 kg)	
Supplied Accessories	Power cord, instruction manual, remote control connector	

Note: All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of 23 °C ± 5 °C. Specifications are subject to change without notice.

8 Certification

CE Compliant

CE Declaration of Conformity

The power supply meets the requirements of 2006/95/EC Low Voltage Directive and 2004/108/EC Electromagnetic Compatibility Directive.

Low Voltage Directive

- EN60950
  - Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive

- EN 55022
  - Electrical equipment for measurement, control, and laboratory use.