

2220-30-1 2230-30-1

Multi-Channel Programmable DC Power Supplies



- **Dual and triple output models with two 30V/1.5A (45W) channels and a 6V/5A (30W) channel on the triple output supply**
- **All channels are independently controlled and have isolated outputs for maximum flexibility**
- **All channels have remote sensing to ensure that programmed voltage is accurately applied to the load**
- **Two 30V channels can be combined either in series to double output voltage or in parallel to double output current**
- **0.03% basic voltage output accuracy and 0.1% current accuracy ensure quality test data**
- **Low noise, linear regulation with <3mVpp ripple and noise**
- **Voltage and current outputs for all channels are displayed simultaneously for easy observation of each output state**
- **Keypad entry allows fast, precise entry of output values**
- **Standard USB interface for automated testing**

The Series 2200 Multi-channel Programmable DC Power Supplies combine two and three channels of output power to cost-effectively characterize and test a wide range of devices, circuit boards, modules, and products that require more than one power source. The Model 2220-30-1 supply provides two channels, with each channel capable of outputting up to 30V and up to 1.5A. The Model 2230-30-1 includes two 30V/1.5A channels and adds a 6V channel with up to 5A output for powering digital circuits. The Series 2200 Multi-channel Power Supplies offer an excellent combination of performance, versatility, and ease of use to maximize the information from characterization or test as quickly and as easily as possible. They perform as effectively in automated test systems as they do in manual instrument configurations.

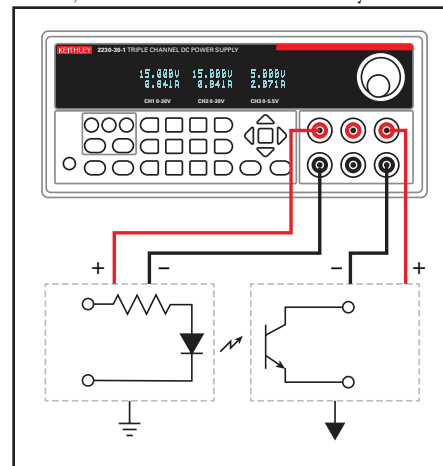
Independent and Isolated Outputs

Since each channel in the Series 2200 Multi-channel Power Supplies is completely independent and isolated from each other, these power supplies can be used to provide power to two circuits that are optically isolated or transformer-isolated from each other and have different reference points. Their isolated channels eliminate the need for a second power supply to power one of the isolated circuits.

Additionally, each channel can be independently controlled, so channels can be individually turned on and turned off at any time. Thus, these power supplies can be used to power up a circuit, such as a digital circuit, that requires multiple voltage levels that must be turned on in a specified time sequence. Furthermore, a timer capability allows the user to set up an unattended test and to turn off the channels after a programmed time interval to protect a device-under-test (DUT) from potential damage due to the continuous application of power beyond a recommended time interval. Both isolated and independent channels provide excellent versatility and flexibility to address a wide range of test applications.

Accurate Power Delivery to the Load

With basic voltage setting accuracy and voltage readback accuracy of 0.03% for each channel, the exact voltage programmed for any channel is applied at the output terminals. Plus, the rear panel connections for each channel include remote sense terminals that compensate for voltage drops in the power supply leads. This helps to ensure that the correct voltage is delivered accurately to the load terminals of the DUT. Many multi-channel power supplies do not provide remote sensing, which degrades from overall system accuracy. Great accuracy is not limited to voltage; the basic current setting and readback accuracy is 0.1%, providing high quality load current measure-



Power two isolated circuits with isolated output channels.

1.888.KEITHLEY (U.S. only)

www.keithley.com

A Greater Measure of Confidence

KEITHLEY
A Tektronix Company

2220 2230

Ordering Information

2220-30-1

**Programmable Dual
Channel DC Power Supply**

2220J-30-1

**Programmable Dual Channel
DC Power Supply for Japan**

2230-30-1

**Programmable Triple
Channel DC Power Supply**

2230J-30-1

**Programmable Triple
Channel DC Power
Supply for Japan**

Accessories Supplied

**CS-1655-15 Rear Panel
Mating Connector for Series
2200 Power Supplies**
Documentation and Driver CD

ACCESSORIES AVAILABLE

CS-1655-15	Rear Panel Mating Connector for Series 2200 Power Supplies
4299-7	Fixed Rack Mount Kit

SERVICES AVAILABLE

2220-30-1-EW	1-year factory warranty extended 1 additional year from date of shipment
2220-30-1-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2220-30-1-5Y-EW	1-year factory warranty extended to 5 years from date of shipment
C/2220-30-1-3Y-STD	3 calibrations within 3 years of purchase
C/2220-30-1-3Y-DATA	3 (ANSI-Z540-1 compliant) calibrations within 3 years of purchase
C/2220-30-1-5Y-STD	3 calibrations within 5 years of purchase
C/2220-30-1-5Y-DATA	3 (ANSI-Z540-1 compliant) calibrations within 5 years of purchase
2230-30-1-EW	1-year factory warranty extended 1 additional year from date of shipment
2230-30-1-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2230-30-1-5Y-EW	1-year factory warranty extended to 5 years from date of shipment
C/2230-30-1-3Y-STD	3 calibrations within 3 years of purchase
C/2230-30-1-3Y-DATA	3 (ANSI-Z540-1 compliant) calibrations within 3 years of purchase
C/2230-30-1-5Y-STD	3 calibrations within 5 years of purchase
C/2230-30-1-5Y-DATA	3 (ANSI-Z540-1 compliant) calibrations within 5 years of purchase

Note: For Japan versions, add a "J" at the end of the series number (ie: 2220J and 2230J)

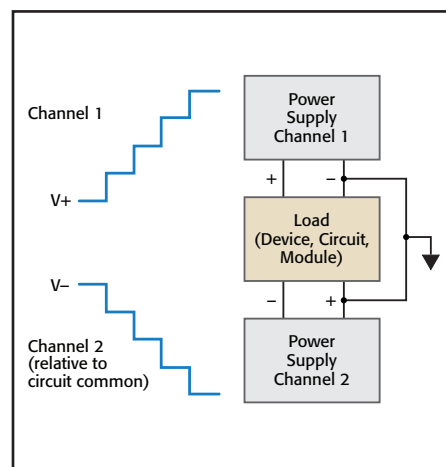
Multi-Channel Programmable DC Power Supplies

ments. Also, with less than 3mV p-p noise, the power applied to the DUT's load terminals is both accurate and of high quality.

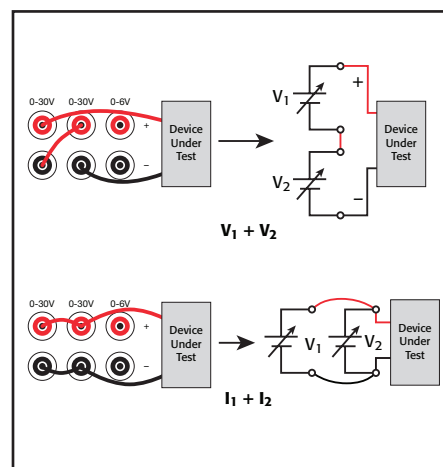
The maximum output power of 45W on the 30V channels and 30W on the 6V channel, combined with voltage setting and reading resolution of 1mV and current setting and reading resolution of 1mA, generate a wide range of output power and read a wide range of load currents. Excellent accuracy, remote sensing, and a wide power output range make the Series 2200 Multi-channel Power Supplies a critical test instrument either on the bench or in a test system.

Configure the Channels to Double Output Voltage or Current or Create Bipolar Power Supplies

The two 30V channels can be combined if more than 30V or more than 1.5A is required. The two 30V outputs can be wired in series to enable an output of 60V with a maximum current output of 1.5A or can be wired in parallel to get up to 3A at 30V. In series or parallel configurations, the power supplies offer special display modes that indicate the actual voltage and current for the combined pair. It's also easy to wire the outputs to make a $\pm 30V$ bipolar supply, and to maintain a user-defined ratio between the two outputs when using Tracking mode. These modes of operation extend the performance of the power supplies, while the display shows the actual outputs in these special modes to avoid any confusion or incorrect interpretation of the displayed data.



Use the two 30V channels to test a bipolar integrated circuit or a bipolar module over its specified voltage operating range.



Combine two channels in series to output up to 60V or combine two channels in parallel to output up to 3A. The Model 2220/2230 display will show the combined value.

Convenience Features Help Get Results More Quickly

The Series 2200 Multi-channel Power Supplies offer a number of features that return results quickly and easily:

- A rotary knob, with user-selectable step size, makes it easy to check circuit response to changing voltage or current. Alternatively, a direct-entry numeric keypad can be used to simplify setting precise voltage and current values.
- Each channel has its own readout on the display. The voltage and current being delivered to each channel are visible at a glance. A bright vacuum fluorescent display provides excellent readability at a distance, at an angle, or under dim lighting conditions.
- To save time when repeating tests, instrument settings can be saved in one of 30 internal memory locations by simply pressing the Save button. To recall that setting, just push the Recall button, and choose the desired setup.

1.888.KEITHLEY (U.S. only)

www.keithley.com

A Greater Measure of Confidence

KEITHLEY
A Tektronix Company

2220 2230

Multi-Channel Programmable DC Power Supplies

Protection for Your Device-Under-Test

The Series 2200 Multi-channel Power Supplies include maximum voltage settings that prevent voltage from being accidentally adjusted above user-specified limits. Independent outputs allow a different limit to be specified for each output channel. With the numeric keypad, a current limit can be quickly and precisely specified before a test is started. In addition, a user-definable password allows the front panel to be locked to prevent unwanted adjustment during critical tests.

Easily Test Automation

Each of these power supplies includes a USB TMC-compliant device port, enabling PC control from a user-preferred programming environment. For basic instrument control, data logging, and analysis, the Series 2200 Multi-channel Power Supplies can be controlled by Tektronix Edition LabVIEW SignalExpress™ from National Instruments. SignalExpress supports a wide range of Tektronix bench instruments* and can be used to automate the entire test bench or test system. The features in each instrument are accessible from one intuitive software interface that can automate complex measurements that require multiple instruments and easily capture and analyze results—all from the user's PC.

*For a complete listing of Tektronix instruments supported by Tektronix LabVIEW Signal Express, visit www.tektronix.com/signalexpress.

APPLICATIONS

Series 2200 Multi-channel Power Supplies typical applications include:

- Circuit design
- Electrical engineering student labs
- Materials research
- Automated test

Specifications

2230-30-1, 2230J-30-1				2220-30-1, 2230J-30-1		
DC OUTPUT RATING						
Voltage	0 to 30 V		0 to 30 V	0 to 6 V	0 to 30 V	0 to 30 V
Current	0 to 1.5 A		0 to 1.5 A	0 to 5 A	0 to 1.5 A	0 to 1.5 A
MAXIMUM POWER			120 W		90 W	
LOAD REGULATION						
Voltage	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV
Current	< 0.01% + 3 mA	< 0.01% + 3 mA	< 0.01% + 3 mA	< 0.01% + 3 mA	< 0.01% + 3 mA	< 0.01% + 3 mA
LINE REGULATION						
Voltage	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV	< 0.01% + 3 mV
Current	< 0.1% + 3 mA	< 0.1% + 3 mA	< 0.1% + 3 mA	< 0.1% + 3 mA	< 0.1% + 3 mA	< 0.1% + 3 mA
RIPPLE AND NOISE						
Voltage (7MHz)	< 1 mV rms < 3 mV p-p	< 1 mV rms < 3 mV p-p	< 1 mV rms < 3 mV p-p	< 1 mV rms < 3 mV p-p	< 1 mV rms < 3 mV p-p	< 1 mV rms < 3 mV p-p
Current (20MHz)	< 5 mA rms	< 5 mA rms	< 6 mA rms	< 5 mA rms	< 5 mA rms	< 5 mA rms
SETTING RESOLUTION						
Voltage	1 mV	1 mV	1 mV	1 mV	1 mV	1 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA	1 mA
SETTING ACCURACY						
Voltage	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV
Current	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA
METER RESOLUTION						
Voltage	1 mV	1 mV	1 mV	1 mV	1 mV	1 mV
Current	1 mA	1 mA	1 mA	1 mA	1 mA	1 mA
METER ACCURACY						
Voltage	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV	± 0.03% + 10 mV
Current	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA	± 0.1% + 5 mA

ISOLATION VOLTAGE, OUTPUT TO CHASSIS: Any output can be floated up to 240V (DC + peak AC with AC limited to a maximum of 3Vpk-pk and a maximum frequency of 60Hz) relative to earth ground terminal.

ISOLATION VOLTAGE, OUTPUT TO OUTPUT: Any output can be floated up to 240V (DC + peak AC with AC limited to a maximum of 3Vpk-pk and a maximum frequency of 60Hz) relative to any other output terminal.

VOLTAGE TRANSIENT RESPONSE SETTLING TIME, LOAD CHANGE (TYPICAL): <150ms to within 75mV following a change from 0.1A to 1A.

VOLTAGE TRANSIENT RESPONSE SETTLING TIME, SETTING CHANGE, RISING (TYPICAL): <150ms to within 75mV following a change from 1V to 11V into a 10Ω resistor (ch. 1,2); from 0.4V to 4V into a 4Ω resistor (ch. 3.)

VOLTAGE TRANSIENT RESPONSE SETTLING TIME, SETTING CHANGE, FALLING (TYPICAL): <150ms to within 75mV following a change from 11V to 1V into a 10Ω resistor (ch. 1,2); from 0.4V to 4V into a 4Ω resistor (ch. 3.)

DISPLAY: Vacuum fluorescent display.

MEMORY: 30 setup memories.

TRACKING AND COMBINATION MODES:

Tracking Mode: Maintains the ratio on the two 30V output channels that is present when the control is activated.

Combination V1+V2 Series Mode: Deliver up to 60 V when CH1 and CH2 are wired in series. Meter reads back combined voltage.

Combination I1+I2 Parallel Mode: Deliver up to 3 A when CH1 and CH2 are wired in parallel. Meter reads back combined current.

REAR PANEL CONNECTIONS: USB Device Port, Type B con-

necter, USBTMC compatible..

POWER SOURCE

110 VAC SETTING: Standard Versions: 99 to 121V rms.
Japan (J) Versions: 90 to 110V rms.

220 VAC SETTING: Standard Versions: 198 to 242V rms.
Japan (J) Versions: 180 to 220V rms.

FREQUENCY: 47Hz to 63Hz.

POWER CONSUMPTION: Standard Versions: 450VA.
Japan (J) Versions: 450VA.

PHYSICAL CHARACTERISTICS

PROTECTIVE BOOTS AND HANDLE INSTALLED:

Height: 105.3mm (4.15 in.)

Width: 241.8mm (9.52 in.)

Depth: 384.0mm (15.12 in.)

PROTECTIVE BOOTS AND HANDLE REMOVED:

Height: 90.7mm (3.57 in.)

Width: 217.2mm (8.55 in.)

Depth: 361.6mm (14.24 in.)

NET WEIGHT:

2220-30-1: 8.2 kg (18 lb.)

2230-30-1: 8.5 kg (19 lb.)

SHIPPING WEIGHT:

2220-30-1: 11 kg (24 lb.)

2230-30-1: 11 kg (24 lb.)

1.888.KEITHLEY (U.S. only)

www.keithley.com

A Greater Measure of Confidence

KEITHLEY
A Tektronix Company

2220 2230

Multi-Channel Programmable DC Power Supplies

ENVIRONMENTAL AND SAFETY

TEMPERATURE: Operating: 0° to +40°C.

Storage: -20° to +70°C.

RELATIVE HUMIDITY (non-condensing):

OPERATING: 5% to 95% relative humidity at up to +40°C

STORAGE: 5% to 95% relative humidity at up to +40°C. 5% to 60% RH above +40°C up to +70°C, non condensing.

ALTITUDE:

OPERATING: Up to 2000m.

STORAGE: Up to 4000m.

SAFETY:

EUROPEAN UNION: Complies with European Union EMC Directive.

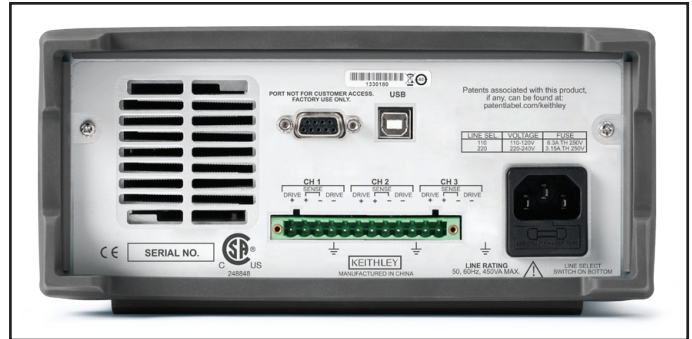
USA: Nationally recognized testing laboratory listing UL61010-1-2004.

CANADA: CAN/CSA C22.2 No. 61010-1 2004.

ELECTROMAGNETIC COMPATIBILITY

EUROPEAN UNION: Complies with European Union Low Voltage Directive.

AUSTRALIA: EMC Framework, demonstrated per Emission Standard AS/NZS 2064 (Industrial, Scientific, and Medical Equipment).



Model 2230-30-1 rear panel.

Specifications are subject to change without notice. All Keithley trademarks and trade names are the property of Keithley Instruments, Inc. All other trademarks and trade names are the property of their respective companies.

KEITHLEY

A Tektronix Company

A Greater Measure of Confidence

KEITHLEY INSTRUMENTS, INC. ■ 28775 AURORA RD. ■ CLEVELAND, OH 44139-1891 ■ 440-248-0400 ■ Fax: 440-248-6168 ■ 1-888-KEITHLEY ■ www.keithley.com

BELGIUM

Sint-Pieters-Leeuw
Ph: 02-3630040
Fax: 02-3630064
info@keithley.nl
www.keithley.nl

CHINA

Beijing
Ph: 86-10-8447-5556
Fax: 86-10-8225-5018
china@keithley.com
www.keithley.com.cn

FRANCE

Les Ulis
Ph: 01-69868360
Fax: 01-69868361
info@keithley.fr
www.keithley.fr

GERMANY

Germering
Ph: 089-84930740
Fax: 089-84930734
info@keithley.de
www.keithley.de

INDIA

Bangalore
Ph: 080-30792600
Fax: 080-30792688
support_india@keithley.com
www.keithley.in

ITALY

Peschiera Borromeo (Mi)
Ph: 02-5538421
Fax: 02-55384228
info@keithley.it
www.keithley.it

JAPAN

Tokyo
Ph: 81-3-6714-3070
Fax: 81-3-6714-3080
info.jp@keithley.com
www.keithley.jp

KOREA

Seoul
Ph: 82-2-574-7778
Fax: 82-2-574-7838
keithley@keithley.co.kr
www.keithley.co.kr

MALAYSIA

Penang
Ph: 60-4-643-9679
Fax: 60-4-643-3794
sea@keithley.com
www.keithley.com

NETHERLANDS

Son
Ph: 040-2675502
Fax: 040-2675509
info@keithley.nl
www.keithley.nl

SINGAPORE

Singapore
Ph: 65-6747-9077
Fax: 65-6747-2991
sea@keithley.com
www.keithley.com.sg

TAIWAN

Hsinchu
Ph: 886-3-572-9077
Fax: 886-3-572-9031
info_tw@keithley.com
www.keithley.com.tw

UNITED KINGDOM

Bracknell
Ph: 044-1344-392450
Fax: 044-1344-392457
info@keithley.co.uk
www.keithley.co.uk