

224 Programmable Current Source

- $\pm 5\text{nA}$ to 101mA DC output
- $10^{12}\Omega$ output resistance
- Auto increment/decrement
- HI-10 limits for auto increment/decrement
- $\pm 1\text{V}$ to $\pm 105\text{V}$ programmable V-LIMIT

The Model 224 programmable current source was designed for general purpose bench or system use. The INCREMENT/DECREMENT function is manual or automatic, and selectable dwell times provide stepped ramp capabilities.

The Model 2243 IEEE-488 option is field installable. It allows flexible programming including current, V-LIMIT, local lockout, service request masks, and serial polling. A digital I/O port on the IEEE-488 interface card provides four TTL-compatible input and output lines. The status of the I/O port can be interrogated and changed over the bus.



The AUTO function allows automatic incrementing or decrementing of the output. Time per step can be set from 50ms/step to 999.9s/step. In some applications, it is necessary to limit the voltage across the device under test. The Model 224 offers compliance limit settings ranging from $\pm 1\text{V}$ to $\pm 105\text{V}$ in 1V steps. An SRQ on V-LIMIT can be programmed if the 2243 IEEE-488 option is installed. A blinking LED indicates V-LIMIT for bench operation.

ORDERING INFORMATION

- 224** Programmable Current Source with instruction manual and Model 6011 Input Leads, 1.5m (5 ft), Triax to Clips
- 224/2243** Programmable Current Source with IEEE-488 interface, instruction manual and Model 6011 Input Leads, 1.5m (5 ft), Triax to Clips

This product is available with an **Extended Warranty**. See section C for complete ordering information.

ACCESSORIES AVAILABLE

TEST LEADS

- 6011 Input Leads, 2-Slot Male Triax to Alligator Clips, 1.5m (5 ft)
- 6011-10 Input Leads, 2-Slot Male Triax to Alligator Clips, 3m (10 ft)

CABLES

- 7007-1 Shielded IEEE-488 Cable, 1m (3.3 ft)
- 7007-2 Shielded IEEE-488 Cable, 2m (6.6 ft)
- 7008-3 IEEE-488 Digital Cable, 0.9m (3 ft)
- 7008-6 IEEE-488 Digital Cable, 1.8m (6 ft)

ADAPTERS

- 6146 Triax Tee Adapter
- 6147 2-Slot Male Triax to Female BNC Adapter
- 6167 Guarded Input Adapter
- 6172 2-Slot Male to 3-Lug Female Triax Adapter

RACK MOUNT KITS

- 1019A-1 Single Fixed Rack Kit
- 1019A-2 Dual Fixed Rack Kit
- 4288-4 Rack Mount Kit

See page A-231 for descriptions of all accessories.

RANGE	MAXIMUM OUTPUT	ACCURACY (1 Year)		STEP SIZE	TEMPERATURE COEFFICIENT	
		$\pm(\% \text{rdg} + \text{offset})$	$18^\circ\text{--}28^\circ\text{C}$		$\pm(\% \text{rdg} + \text{offset})/^\circ\text{C}$	$0^\circ\text{--}18^\circ\text{C} \ \& \ 28^\circ\text{--}50^\circ\text{C}$
100 mA	$\pm 101.00\text{mA}$	0.1 + 50 μA	50 μA	50 μA	0.01 + 2 μA	
10 mA	$\pm 19.995\text{mA}$	0.05 + 10 μA	5 μA	5 μA	0.005 + 200 nA	
1 mA	$\pm 1.9995\text{mA}$	0.05 + 1 μA	500 nA	500 nA	0.005 + 20 nA	
100 μA	$\pm 199.95 \mu\text{A}$	0.05 + 100 nA	50 nA	50 nA	0.005 + 2 nA	
10 μA	$\pm 19.995 \mu\text{A}$	0.05 + 10 nA	5 nA	5 nA	0.005 + 200 pA	

OUTPUT RESISTANCE: $>10^{12}\Omega$ on the 10 μA range.

OUTPUT CAPACITANCE: $<20\text{pF}$

LINE REGULATION: $<0.01\%$ for AC power line changes within specified limits.

VOLTAGE LIMIT: Bipolar, 1 to 105V in 1V programmable steps.

RESPONSE TIME: $<3\text{ms}$ to within 0.1% of programmed change.

TRANSIENT RECOVERY TIME: $<3\text{ms}$ to rated accuracy following any change in compliance voltage.

RANGE	NOISE (p-p of range)		BANDWIDTH
	100 mA	100 ppm	
100 mA	100 ppm	0.1 Hz to 30 kHz	
10 μA to 10 mA	100 ppm	0.1 Hz to 100 Hz	

GUARD OUTPUT:

Maximum Load Capacitance: 10nF

Maximum Load Current: Absolute total (output + guard) $\leq 105\text{mA}$.

Accuracy: $\pm 1\text{mV}$ (excluding output lead voltage drop).

INCREMENT/DECREMENT: Automatic, manual or trigger modes.

Range of Dwell Times: 50ms to 999.9s.

Accuracy of Dwell Times: $\pm(0.05\% + 20\mu\text{s})$.

Step Size: Selected digit on a fixed range; min. size 0.1% of range.

Current Limit: Maximum is \pm full scale on range selected.

OUTPUT LOAD: Output load must be non-inductive.

EXTERNAL TRIGGER: TTL-compatible EXTERNAL TRIGGER INPUT and OUTPUT.

OUTPUT CONNECTIONS: Teflon[®] insulated 2-lug triax connector (Specialty Connector 30JR121-1) for output; five way binding posts for GUARD, OUTPUT COMMON and CHASSIS GROUND; BNC (chassis isolated) connectors for EXTERNAL TRIGGER INPUT and OUTPUT. All connections on rear panel.

GENERAL

DISPLAY: 0.5 in LED digits, 4 $\frac{1}{2}$ -digit signed mantissa, 1-digit signed exponent.

OVER VOLTAGE LIMIT INDICATION: "V-LIMIT" LED blinks.

MAXIMUM ALLOWABLE COMMON MODE VOLTAGE (OUTPUT or OUTPUT COMMON to CHASSIS): 250V rms, DC to 60Hz.

SELF TEST: Digital RAM, ROM, & front panel LEDs at power ON.

WARM-UP: 1 hour to rated accuracy.

POWER: 105–125 or 210–250V AC (internal switch selected), 50 or 60Hz, 60W maximum (80VA maximum). 90–105 or 180–210V AC operation available.

COOLING: Internal fan for forced air cooling.

ENVIRONMENTAL LIMITS: Operating: 0 $^\circ$ –50 $^\circ\text{C}$; up to 35 $^\circ\text{C}$ at 70% non-condensing relative humidity. **Storage:** -25° to 70 $^\circ\text{C}$.

DIMENSIONS, WEIGHT: 127mm high \times 216mm wide \times 359mm deep (5 in \times 8 $\frac{1}{2}$ in \times 14 $\frac{1}{4}$ in). Net weight 4.5kg (9 lb 15 oz).

ACCESSORIES SUPPLIED: Model 6011 Triaxial Test Lead (3 ft), instruction manual.

IEEE-488 BUS INTERFACE (OPTION 2243)

MULTILINE COMMANDS: DCL, LLO, SDC, GET, GTL, UNT, UNL, SPE, SPD.

UNILINE COMMANDS: IFC, REN, EOI, SRQ, ATN.

INTERFACE FUNCTIONS: SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, CO, EI.

INTERNAL PROGRAMMABLE PARAMETERS: Display Mode, Output, Prefix Data Format, EOI, SRQ (including mask for over V-Limit), Range, Terminator Character, Inputs (Source, V-Limit, Dwell Time), Output Status.

DIGITAL I/O PORT: A separate I/O port consisting of four input and four output lines as well as common (IEEE-488) and +5V DC. Outputs will drive one TTL load. Inputs represent one TTL load. The 224 can be programmed to generate an "SRQ" upon any change in the four bit input data. Mating connector supplied.

QUESTIONS?

1-800-552-1115 (U.S. only)

Call toll free for technical assistance, product support or ordering information.