

2400, 2410, 2420, 2425, and 2430 SourceMeter® Line

- New class of instruments designed for high-speed DC testing
- Choose from standard, high voltage, high current, high power, or pulse mode source and measurement capabilities
- 20W (Model 2400 and 2410), 60W (Model 2420), 100W (Model 2425 and 2430) units
- 0.012% basic accuracy with 5½-digit resolution
- 6-wire Ω measurement with programmable I-Source and V-Clamp
- 1000 rdgs/s at 4½ digits via GPIB
- Built-in comparator for fast pass/fail testing
- Digital I/O for fast binning or connection to component handlers
- Optional Contact Check function
- IEEE-488 and RS-232 interfaces
- TestPoint and LabVIEW drivers



Keithley's new SourceMeter® family is the first series of instruments designed specifically for test applications that demand tightly coupled precision voltage and current sourcing and measurement. They build upon many of the technologies originally developed for Keithley's popular line of Source-Measurement Units (SMUs). All four SourceMeter models combine a precision, low-noise, highly stable DC power supply with readback and a low-noise, highly repeatable, high impedance, 5½-digit multimeter. The result is a compact, single-channel, DC parametric tester. In operation, these instruments can act as a V-Source, an I-Source, a V-Meter, an I-Meter, and an ohmmeter. Manufacturers of communications, computer, automotive, and consumer electronics products will find them invaluable for a wide range of design and production test applications.

By linking source and measurement circuitry in a single unit, these instruments offer a variety of advantages over systems configured with separate source and measurement instruments. For example, their compact half-rack size conserves precious "real estate" in the test rack or bench. They also minimize the test station development, set-up, and maintenance time required, while lowering the overall cost of system ownership. In addition, SourceMeters simplify the test process itself by eliminating many of the complex synchronization and connection issues associated with using multiple instruments.

Five Source and Measurement Range Choices

The SourceMeter family offers a choice of five sets of source and measurement ranges, so test system developers can select the instrument best suited for the types of components to be tested.

- The Model 2400 SourceMeter is a 20W instrument that allows sourcing and measuring voltage from $\pm 1\mu\text{V}$ to $\pm 200\text{V}$ DC and current from $\pm 10\text{pA}$ to $\pm 1\text{A}$. It's well-suited for testing a wide range of devices, including diodes, resistors, resistor networks, active circuit protection devices, and portable battery-powered devices and components. It's also useful for systems power sourcing and I_{DDQ} testing applications.
- The Model 2410 High Voltage SourceMeter is a 20W instrument that sources and measures voltage from $\pm 1\mu\text{V}$ to $\pm 1100\text{V}$ and current from $\pm 10\text{pA}$ to $\pm 1\text{A}$. The higher voltage sourcing range makes it a good choice for resistors and voltage coefficient testing, varistors, and high voltage diodes, including switching, zener, RF diodes, and rectifiers. A 20mA measurement range gives the Model 2410 the extra resolution needed for precision testing of high voltage varistors.
- The Model 2420 High Current SourceMeter is a 60W instrument designed to source and measure voltage from $\pm 1\mu\text{V}$ to $\pm 60\text{V}$ and current from $\pm 100\text{pA}$ to $\pm 3\text{A}$. Production test applications for the Model 2420 include resistors and resistor network devices that must be tested at higher current levels, thermistors, solar cells, batteries, and high current or medium power diodes, including switching and Schottky diodes. The Model 2420 is also suitable for I_{DDQ} testing of CMOS integrated circuits and monitoring the current consumption of battery-powered medical devices such as pacemakers.
- The Model 2425 100W SourceMeter extends the voltage range of the 2420 to 100V, enabling 100W capability in the 1A range. Like the 2420, it also offers a 3A range with 60W power capability. The

ORDERING INFORMATION

Model 2400	SourceMeter
Model 2410	High Voltage SourceMeter
Model 2420	High Current SourceMeter
Model 2425	100W SourceMeter
Model 2430	Pulse Mode SourceMeter
Model 2400-C	SourceMeter with Contact Check
Model 2410-C	High Voltage SourceMeter with Contact Check
Model 2420-C	High Current SourceMeter with Contact Check
Model 2425-C	100W SourceMeter with Contact Check
Model 2430-C	Pulse Mode SourceMeter with Contact Check

These products are available with an Extended Warranty. See page 635 for complete ordering information.

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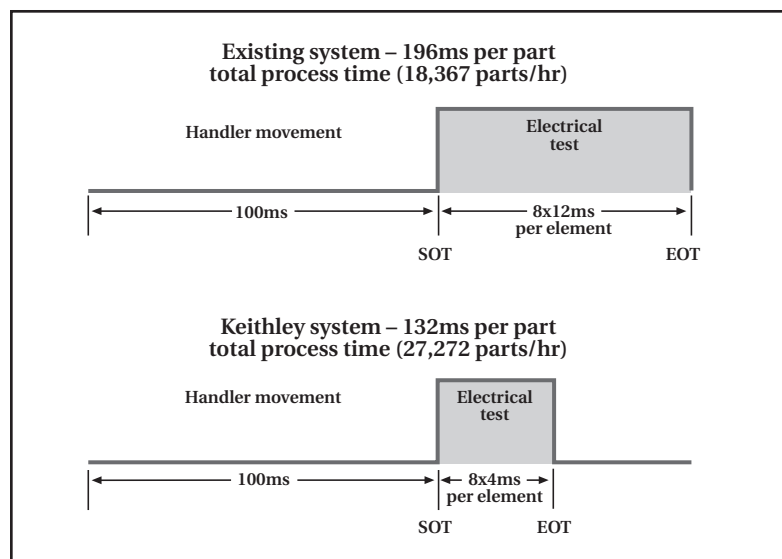
Model 2425 was designed for production testing of medium-power devices like DC-to-DC converters, power supplies, and other components requiring between 60W and 100W of total DC power.

- The Model 2430 1kW Pulse SourceMeter offers the same DC source and measurement ranges as the 2425, plus a unique 1kW pulse mode that extends the upper current limit to 10A. This mode makes the Model 2430 ideal for measuring the breakdown voltage of many types of high-power devices, including multi-layer varistors (MLVs) and semiconductor components. During production testing of these devices, breakdown voltage is often measured under a high current pulse of up to 10A. The Model 2430 combines programmable bipolar voltage and current sourcing of up to 10A @ 100V (pulsed) with all the high-speed testing capabilities common to the Series 2400 family. The Model 2430 can be programmed to produce individual pulses or pulse trains up to 5ms wide and with varying duty cycle on most source ranges. Pulses up to 2.5ms long and an 8% duty cycle can be programmed on the instrument's 1kW range. When combined with a PC controller and the appropriate switching hardware, the Model 2430 provides an economical, high-throughput solution for high-power varistor testing, all in one compact, half-rack box. Other solutions offering compatible capabilities, such as discrete semiconductor component testers, typically cost four times as much as the Model 2430 and required significantly more rack space.

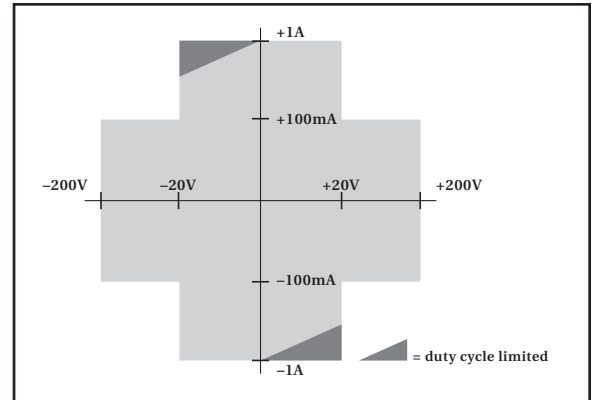
All five SourceMeter instruments are suitable for making a wide range of DC measurements, including resistance at a specified current or voltage, breakdown voltage, leakage current, insulation resistance, and electrical characterization.

High throughput for production testing

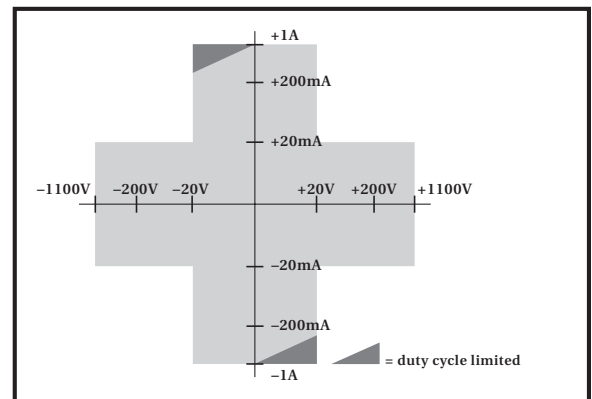
The 2400 line lets you perform high-speed single or multi-point pass/fail testing on a wide range of components, such as network devices, circuit protection devices, active discrete devices, and sensors. The line's 1000 rdgs/s at 4½ digits through a GPIB (IEEE-488) connection ensures higher throughput. The buffer memory can store up to 5000 5½-digit readings. An on-board comparator simplifies high-speed pass/fail tests without the delay of computer/ IEEE-488 interaction.



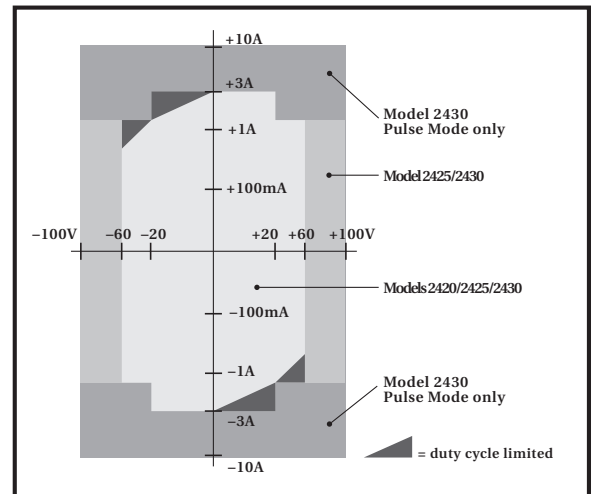
The timing diagram above shows a typical production system throughput improvement of nearly 50% achieved by a 2400 based test system with a 7001 switching system and a handler with a 100ms handling time.



Model 2400 Dynamic Range



Model 2410 Dynamic Range



Model 2420/2425/2430 Dynamic Range

QUESTIONS?

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

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The 2400 line has built-in, user-definable math functionality to compute derived parameters such as power dissipation, voltage coefficient, % deviation, alpha, ratio, and other mathematical formulas, such as $mX+b$.

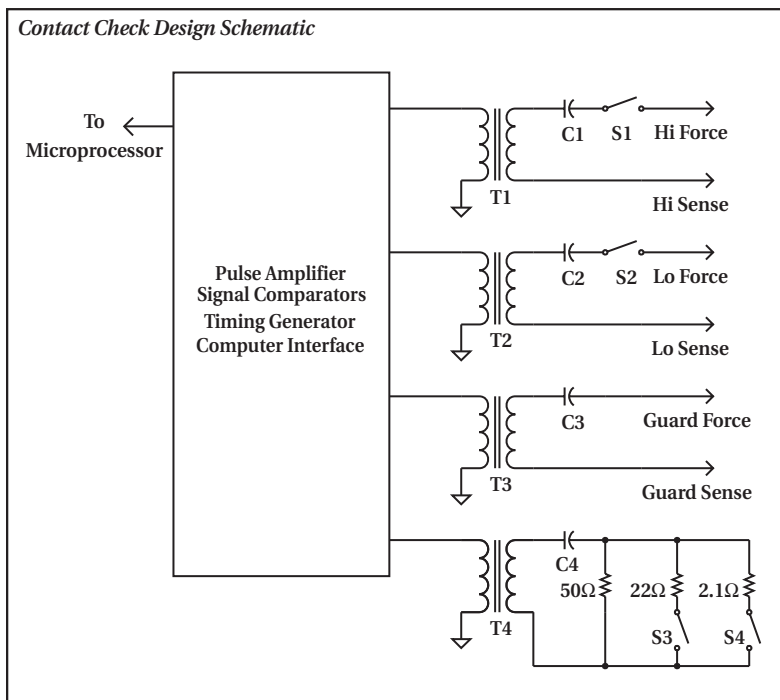
A digital I/O interface lets you link the 2400 family to many popular component handlers, including Aetrium, Aseco, and Robotronics, for tight systems integration in binning, sorting, and similar applications, which speeds up the production process. Included are start of test and end of test signals, three category bits, and a 5V, 300mA supply. A new digital I/O expander accessory provides 16 digital I/O lines for greater binning capacity, and can be used with any of the SourceMeter models.

A Source Memory List allows up to 100 instrument configurations to be stored in memory, each containing source settings, sense (measurement) settings, and pass/fail criteria.

The 2400 line also has our unique Trigger-Link interface to provide seamless integration with Keithley Series 7000 switching hardware for complete multi-point test solutions.

The 2400 family's half-rack size saves valuable space, providing increased test capacity within a given area. It is ruggedly designed for non-stop production environments with 75,000-hour MTBF. It also has certification to CE and a full one-year warranty.

Contact Check Design Schematic



Optional Contact Check Function

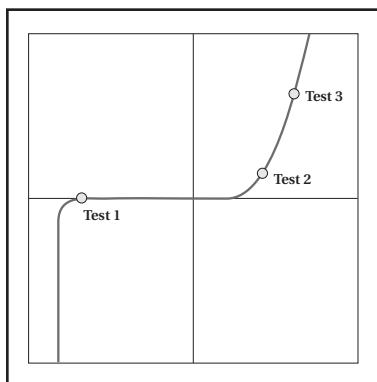
In the production test environment, measurement errors and false product failures can often be traced to a variety of problems, including contact fatigue, breakage, or contamination, loose or broken connections, or relay failures. Keithley's optional Contact Check function, now available for the Series 2400 SourceMeter line, makes it simple to verify good connections quickly and easily, before an automated test sequence begins.

The Contact Check function completes the verification and notification process in just 350μs; comparable capabilities in other test equipment can require up to 5ms to perform the same function. Contact Check can be enabled with the controls on the instrument's front panel or remotely via the GPIB. Contact is verified simply by making a differential measurement of the unknown resistance between a force lead and its sense lead (Kelvin contacts) to a programmable reference resistance in an equivalent circuit; in other words, only the difference between the two resistances is measured and no energy passes through the DUT during the operation. If the value of that differential measurement is too high, the contact has failed the check. Three reference value choices are offered to accommodate different system configurations.

The software that controls the Contact Check function offers three methods of fault notification. The instrument's front panel display indicates "Open Lead" and a flag is set in a register that can be queried through the GPIB port. Once a part has failed the contact check, the instrument's digital I/O can also be used to synchronize with an automatic handler to index to the next part or to retest the same part. The output of the SourceMeter is automatically shut off when a part fails the contact check and is not re-activated until good contact is verified. This feature protects the device under test (DUT) from damage and the operator from potential safety hazards.

Source memory list for sequenced testing

The source memory list is a key 2400 family feature for production testing. This built-in "programmable test sequencer" lets you configure a sequence of up to 100 different tests. Each test can contain totally different test conditions, measurements, math, pass/fail, or binning criteria. The tests are executed sequentially without additional external commands. Conditional branching leads to different points on the test list, depending on results. The source memory list resides in battery-backed memory and can be accessed with or without a computer. The example shows a three-step diode test. The setup for each test would be stored in a separate source memory location. One IEEE trigger would initiate the execution of the sequence of three tests.



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Unique 6-Wire Ohms Technique

SourceMeter units can make standard 4-wire, split Kelvin, and 6-wire, guarded ohms measurements, and can be configured for either the constant current or constant voltage method. When used with a high-speed switching mainframe such as the Keithley Model 7001 or 7002 Switch Mainframe, the Model 2400 SourceMeter is well-suited for testing a wide range of resistor network devices. The 6-wire ohms technique, unique to these instruments, uses Guard and Guard Sense leads in addition to the 4-wire Sense and Source leads to guard out parallel current paths when measuring networks or hybrid circuits. This technique avoids the complications of the DUT being shunted by other resistances in the circuit, which can create measurement errors and slow throughput. This broad range of resistance measurement capabilities makes SourceMeter instruments ideal for production testing of a wide range of resistive devices, including isolated and bussed resistor networks, R/2R ladder resistor networks, and dual terminator resistor networks.

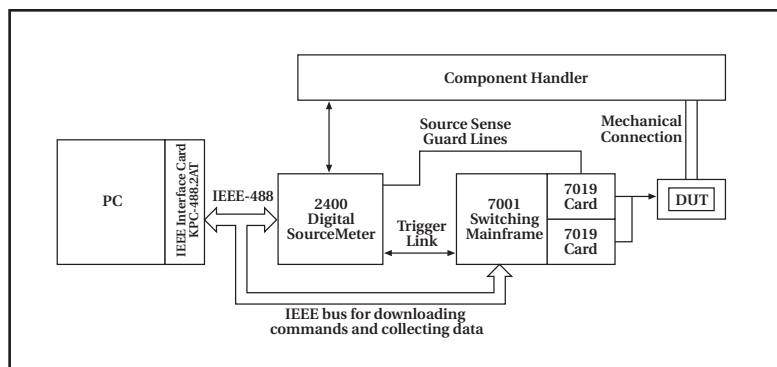
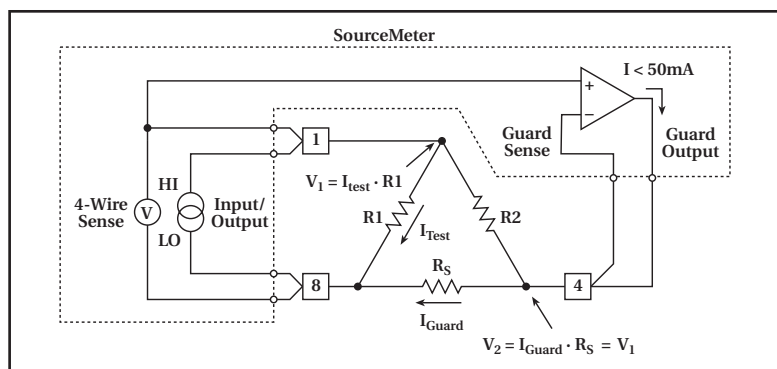
A Broad Range of Component Test Applications

• Diode Testing

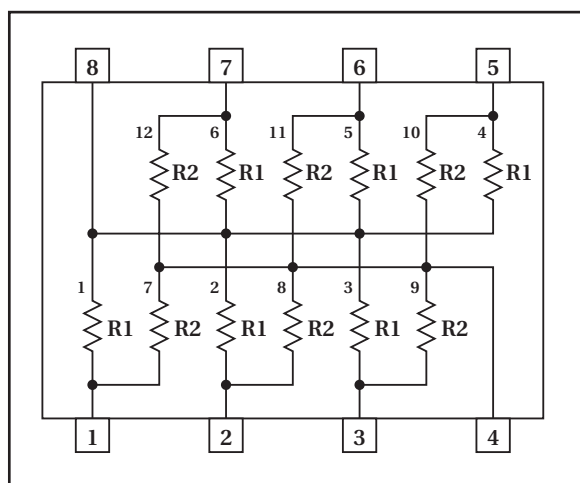
SourceMeter units can source and measure voltage and current quickly, then switch test configurations automatically, which makes them ideal for measuring the forward voltage, breakdown voltage, and leakage current of devices such as signal diodes, RF diodes, zener diodes, LEDs, LED display, and laser diodes. They also offer single or multi-point pass/fail criteria, a digital I/O for automated binning, programmable compliance, and a source memory list for automating test sequences with conditional branching, which makes them a good choice for fast pass/fail, go/no-go diode verification.

• Testing Resistive Devices and Networks

Typically, tests on resistor networks fall into one of three general measurement categories: standard 4-wire Kelvin measurements, 6-wire guarded ohms or delta resistance measurements, or “Y” circuit or buried node resistance measurements (also called split Kelvin measurements). All tests are basically single-point resistance measurements performed using either constant current or constant voltage. SourceMeter instruments allow the use of either technique and can adjust the values for the source and measurement ranges to accommodate the manufacturer’s specifications, to ensure maximum accuracy/reliability and measurement



This SourceMeter test system configuration is capable of handling a wide range of network devices with up to 12 pins, and is expandable for devices with up to 60 pins.

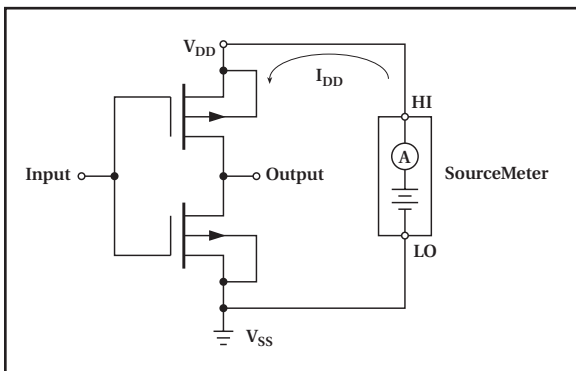
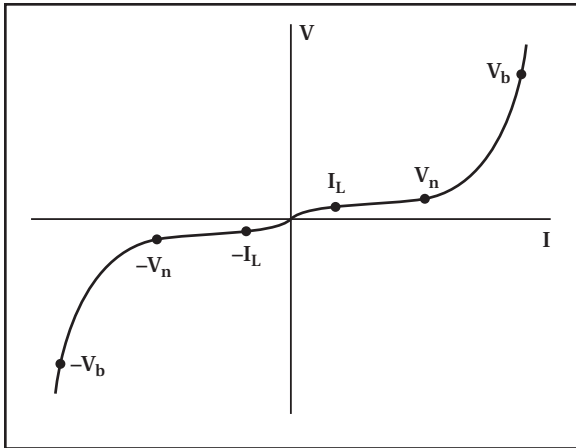


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speed. They can even tolerate lead resistances up to 1MΩ for split Kelvin measurements. SourceMeter units can also perform a variety of product reliability tests, including isolation resistance, voltage coefficient, ratio matching, shorts and opens, etc.

• Active Circuit Protection Device Testing

During varistor production, a SourceMeter instrument's bipolar source and measure capabilities can be used to perform breakdown (clamp) and nominal voltage tests, leakage current measurements, and a non-linear (alpha) test. The Model 2430's 1kW pulse mode is particularly useful for high-current testing of multi-layer varistors. For PTC or NTC thermistors, resistance can be verified by measuring it with a controlled source current. SourceMeter instruments can also make periodic compensation measurements to verify environmental temperature has not affected the measured resistance.

• I_{DDQ} and Power Consumption Testing

Manufacturers of CMOS integrated circuits and battery-powered electronic products can use SourceMeter instruments to measure the quiescent (or "standby") power supply current to verify quality during production testing. The process of measuring the leakage currents of CMOS integrated circuits or finished products that contain CMOS ICs is known as " I_{DDQ} " testing. This test requires using the SourceMeter to measure the current of the V_{DD} power supply while the IC is in the quiescent state to check for shorted gate oxide and other IC defects that may cause a failure over time. Similarly, the power supply current of battery-powered products that contain bipolar transistors or other ICs can be measured while these ICs are in a quiescent mode.

ACCESSORIES AVAILABLE

SWITCHING HARDWARE

7001	Two-Slot Switch System
7002	Ten-Slot Switch System
7019-C	6-Wire Ohms Switch Card
7053	High-Current Switch card (cold switching only)

TEST LEADS AND PROBES

5806	Kelvin Clip Lead Set
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CABLES/ADAPTERS

2499-DIGIO	Digital I/O Expander Assembly
7007-1	Shielded GPIB Cable, 1m (3.3 ft)
7007-2	Shielded GPIB Cable, 2m (6.6 ft)
7009-5	RS-232 Cable
8501-1	Trigger Link Cable, 1m (3.3 ft)
8501-2	Trigger Link Cable, 2m (6.6 ft)
8502	Trigger Link Adapter Box
8503	DIN-to-BNC Trigger Cable
8505	Male to 2-Female Y-DIN Cable for Trigger Link

RACK MOUNT KITS

4288-1	Single Fixed Rack Mount Kit
4288-2	Dual Fixed Rack Mount Kit

OTHER

1050	Padded Carrying Case
2400-EW	1-Year Warranty Extension
2410-EW	1-Year Warranty Extension
2420-EW	1-Year Warranty Extension
2425-EW	1-Year Warranty Extension
2430-EW	1-Year Warranty Extension
KPC-488.2AT	GPIB/IEEE-488 Interface Card for IBM PC/AT (full slot)
KPC-TM	Trigger Master Interface
KPCI-488	IEEE-488 Interface/Controller for the PCI Bus
TestPoint	Test Development Software

See page 235 for descriptions of all accessories.

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SOURCE SPECIFICATIONS¹

VOLTAGE PROGRAMMING ACCURACY (Local or Remote Sense)

MODEL	RANGE	PROGRAMMING RESOLUTION	ACCURACY (1 Year)	NOISE
			23°C ±5°C ±(% rdg. + volts)	(peak-peak) 0.1Hz – 10Hz
All:	200.000 mV	5 μV	0.02% + 600 μV	5 μV (10μV 2430)
	2.00000 V	50 μV	0.02% + 600 μV	50 μV
	20.0000 V	500 μV	0.02% + 2.4 mV	500 μV
2400 Only:	200.000 V	5 mV	0.02% + 24 mV	5 mV
2410 Only:	1000.00 V	50 mV	0.02% + 100 mV	20 mV
2420 Only:	60.0000 V	1.5 mV	0.02% + 7.2 mV	1500 μV
2425 and 2430 Only:	100.0000 V	2.5 mV	0.02% + 12 mV	2.5 mV

TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C): ±(0.15 × accuracy specification)/°C.

MAX. OUTPUT POWER: 22W (66W for Model 2420, 110W for Model 2425 and 2430), four quadrant source or sink operation.

SOURCE/SINK LIMITS: Model 2400: ±21V @ ±1.05A, ±210V @ ±105mA.
Model 2410: ±21V @ ±1.05A, ±1100V @ ±21mA.
Model 2420: ±1.05A @ ±63V, ±3.15A @ ±21V.
Model 2425: ±1.05A @ ±105V, ±3.15A @ ±21V.
Model 2430: ±1.05A @ ±105V, ±10.5A @ ±105V (pulse mode only).

VOLTAGE REGULATION: Line: 0.01% of range. Load: 0.01% of range + 100µV.

NOISE 10Hz–1MHz (p-p): 10mV (50mV max., Model 2430).

OVER VOLTAGE PROTECTION: User selectable values, 5% tolerance. Factory default = none.

CURRENT LIMIT: Bipolar current limit (compliance) set with single value. Min. 0.1% of range.

OVERSHOOT: <0.1% typical (full scale step, resistive load, 10mA range).

CURRENT PROGRAMMING ACCURACY (Local or Remote Sense)

MODEL	RANGE	PROGRAMMING RESOLUTION	ACCURACY (1 Year) ³	NOISE
			23°C ±5°C ±(% rdg. + amps)	(peak-peak) 0.1Hz – 10Hz
2400, 2410:	1.00000 µA	50 pA	0.035 % + 600 pA	5 pA
All:	10.0000 µA	500 pA	0.033 % + 2 nA	50 A
	100.000 µA	5 nA	0.031 % + 20 nA	500 pA
	1.00000 mA	50 nA	0.034 % + 200 nA	5 nA
2400, 2420, 2425, 2430:	10.0000 mA	500 nA	0.045 % + 2 µA	50 µA
2410:	20.0000 mA	500 nA	0.045 % + 4 µA	200 nA
All:	100.000 mA	5 µA	0.066 % + 20 µA	1 µA
2400, 2410:	1.00000 A ²	50 µA	0.27 % + 900 µA	100 µA
2420, 2425, 2430:	1.00000 A	50 µA	0.067 % + 900 µA	50 µA
2420, 2425:	3.00000 A ²	150 µA	0.059 % + 2.7 mA	150 µA
2430:	3.00000 A ² / _{10.00000 A⁴}	500 µA	0.059 % + 2.8 mA	300 µA

TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C): ±(0.15 × accuracy specification)/°C.

MAX. OUTPUT POWER: 22W (66W for Model 2420, 110W for Model 2425 and 2430), four quadrant source or sink operation.

SOURCE/SINK LIMITS: Model 2400: ±105mA @ 210V, ±1.05A @ ±21V.
Model 2410: ±21mA @ 1100V, ±1.05A @ ±21V.
Model 2420: ±1.05A @ 63V, ±3.15A @ ±21V.
Model 2425: ±1.05A @ ±105V, ±3.15A @ ±21V.
Model 2430: ±1.05A @ 105V, ±3.15A @ ±21V, ±10.5A @ 105V 2.5ms pulse.

CURRENT REGULATION: Line: 0.01% of range. Load: 0.01% of range + 100pA.

VOLTAGE LIMIT: Bipolar voltage limit (compliance) set with single value. Min. 0.1% of range.

OVERSHOOT: <0.1% typical (1mA step, RL = 10kV, 20V range).

¹ 2400, 2410 Only: Specifications valid for continuous output currents below 105mA. For operating above 105mA continuous for >1 minute, derate accuracy 10%/35mA above 105mA.

² Full operation (1A) regardless of load to 30°C (50°C for Model 2420). Above 30°C (50°C for Model 2420) ambient, derate 35mA/°C and prorate 35mA/Ω load. 4-wire mode. For current sink operation on 1A or 3A ranges, maximum continuous power is limited to approximately ½ rated power or less, depending on current, up to 30°C ambient. See power equations in the User's Manual to calculate allowable duty cycle for specific conditions.

³ For sink mode, 1µA to 100mA range, accuracy is:

Model 2400: ±(0.15% + offset*4) Models 2410, 2420, 2425, 2430: ±(0.5% + offset*3)

For 1A range, accuracy is:

Model 2400: ±(1.5% + offset*8). Models 2410, 2420, 2425, 2430: ±(1.5% + offset*3).

⁴ 10A range only in pulse mode. Limited to 2.5ms pulse width maximum. 10% duty cycle maximum.

ADDITIONAL SOURCE SPECIFICATIONS

TRANSIENT RESPONSE TIME: 30µs minimum for the output to recover to its spec. following a step change in load.

COMMAND PROCESSING TIME: Maximum time required for the output to begin to change following the receipt of :SOURce:VOLTage|CURRent<nrf> command. Autorange On: 10ms. Autorange Off: 7ms.

OUTPUT SETTLING TIME: Time required to reach 0.1% of final value after command is processed. 100µs typical. Resistive load. 10µA to 100mA range.

OUTPUT SLEW RATE:

Model 2400: 0.5V/µs, 200V range, 100mA compliance.

Model 2410: 0.5V/µs, 1000V range, 20mA compliance.

Model 2420: 0.14V/µs, 60V range, 100mA compliance.

Model 2425 and 2430: 0.25V/µs, 100V range, 100mA compliance.

All: 0.08V/µs, 0.2V, 2V, and 20V ranges, 100mA compliance.

DC FLOATING VOLTAGE: Output can be floated up to ±250V DC from chassis ground.

REMOTE SENSE: Up to 1V drop per load lead.

COMPLIANCE ACCURACY: Add 0.1% of range to base specification.

OVER TEMPERATURE PROTECTION: Internally sensed temperature overload puts unit in standby mode.

RANGE CHANGE OVERSHOOT: Overshoot into a fully resistive 100kΩ load, 10Hz to 1MHz BW, adjacent ranges, Smooth Mode: (100mV) typical, except 20V/200V (20V/60V on Model 2420, 20V/100V on Model 2425 and 2430) range boundary.

MINIMUM COMPLIANCE VALUE: 0.1% of range.

ADDITIONAL PULSE MODE SOURCE SPECIFICATIONS

MAXIMUM DUTY CYCLE: 8%, hardware limited, 10A range only. All other ranges 100%.

MAXIMUM PULSE WIDTH: 5ms from 90% rising to 90% falling edge, 2.5ms 10A range.

MINIMUM PULSE WIDTH: 150µs.

MINIMUM PULSE RESOLUTION: 50µs typical, 70µs max., limited by system jitter.

SOURCE ACCURACY: Determined by settling time and source range specifications.

OUTPUT SETTLING TIME, 0.1%:

800µs typ., source I = 10A into 10Ω, limited by voltage slew rate.

500µs typ., source I = 10A into 1Ω, limited by voltage slew rate.

OUTPUT SLEW RATE:

Voltage (10Ω load): 0.25V/µs ±30% on 100V range
0.08V/µs ±30% on 20V range, 10A range.

Current (0Ω load): 0.25A/µs ±30% on 100V range
0.08A/µs ±30% on 20V range, 10A range.



Model 2400 rear panel

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MEASURE SPECIFICATIONS^{1,2,7}

VOLTAGE MEASUREMENT ACCURACY (Local or Remote Sense)

MODEL	RANGE	MAXIMUM RESOLUTION	INPUT RESISTANCE	ACCURACY (1 Year) 23°C ±5°C ±(% rdg. + volts)
All:	200.000 mV	1 µV	>10 GΩ	0.012 % + 300 µV
	2.000000 V	10 µV	>10 GΩ	0.012 % + 300 µV
2400:	20.0000 V	100 µV	>10 GΩ	0.015 % + 1.5 mV
	200.000 V	1 mV	>10 GΩ	0.015 % + 10 mV
2410:	20.0000 V	100 µV	>10 GΩ	0.015 % + 1 mV
	1000.00 V	10 mV	>10 GΩ	0.015 % + 50 mV
2420, 2425, 2430:	20.0000 V	100 µV	>10 GΩ	0.015 % + 1 mV
2420:	60.0000 V	300 µV	>10 GΩ	0.015 % + 3 mV
2425, 2430:	100.0000 V	500 µV	>10 GΩ	0.015 % + 5 mV

TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C): ±(0.15 × accuracy specification)/°C.

CURRENT MEASUREMENT ACCURACY (Local or Remote Sense)

MODEL	RANGE	MAXIMUM RESOLUTION	VOLTAGE BURDEN ³	ACCURACY (1 Year) 23°C ±5°C ±(% rdg. + amps)
2400, 2410:	1.00000 µA	10 pA	<1 mV	0.029 % + 300 pA
All:	10.0000 µA	100 pA	<1 mV	0.027 % + 700 pA
	100.000 µA	1 nA	<1 mV	0.025 % + 6 nA
	1.00000 mA	10 nA	<1 mV	0.027 % + 60 nA
2400, 2420, 2425, 2430:	10.0000 mA	100 nA	<1 mV	0.035 % + 1.2 µA
2410:	20.0000 mA	100 nA	<1 mV	0.035 % + 1.2 µA
All:	100.000 mA	1 µA	<1 mV	0.055 % + 6 µA
2400, 2410:	1.00000 A	10 µA	<1 mV	0.22 % + 570 µA
2420, 2425, 2430:	1.00000 A	10 µA	<1 mV	0.060 % + 570 µA
2420, 2425:	3.00000 A	30 µA	<1 mV	0.052 % + 1.71 mA
2430:	3.00000 A/ 10.00000 A ⁶	30 µA	<1 mV	0.052 % + 1.71 mA

TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C): ±(0.01 × accuracy specification)/°C.

RESISTANCE MEASUREMENT ACCURACY (4-WIRE Remote Sense), Source I Mode, Auto Ohms

RANGE	MAX. RESOLUTION	DEFAULT TEST CURRENT 2400, 2410	DEFAULT TEST CURRENT 2420, 2425, 2430	2400	NORMAL ACCURACY (23°C ±5°C) 1 YEAR, ±(% rdg. + ohms)	2410	2420, 2425, 2430	ENHANCED ACCURACY (23°C ±5°C) ⁵ 1 YEAR, ±(% rdg. + ohms) 2400
<0.20000 Ω ⁴	1 µΩ	–	–	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Meas. I _{ACC} + Meas. V _{ACC}
2.00000 Ω ⁴	10 µΩ	–	1 A	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Meas. I _{ACC} + Meas. V _{ACC}
20.0000 Ω	100 µΩ	100 mA	100 mA	0.10% + 0.003 Ω	0.11% + 0.006 Ω	0.10% + 0.003 Ω	0.10% + 0.003 Ω	0.07% + 0.001 Ω
200.000 Ω	1 mΩ	10 mA	10 mA	0.08% + 0.03 Ω	0.09% + 0.1 Ω	0.08% + 0.03 Ω	0.08% + 0.03 Ω	0.05% + 0.01 Ω
2.00000 kΩ	10 mΩ	1 mA	1 mA	0.07% + 0.3 Ω	0.08% + 0.6 Ω	0.07% + 0.3 Ω	0.07% + 0.3 Ω	0.05% + 0.1 Ω
20.0000 kΩ	100 mΩ	100 µA	100 µA	0.06% + 3 Ω	0.07% + 6 Ω	0.06% + 3 Ω	0.06% + 3 Ω	0.04% + 1 Ω
200.000 kΩ	1 Ω	10 µA	10 µA	0.07% + 30 Ω	0.07% + 60 Ω	0.07% + 30 Ω	0.07% + 30 Ω	0.05% + 10 Ω
2.00000 MΩ	10 Ω	1 µA	10 µA	0.11% + 300 Ω	0.12% + 600 Ω	0.07% + 100 Ω	0.07% + 100 Ω	0.05% + 100 Ω
20.0000 MΩ	100 Ω	1 µA	1 µA	0.11% + 1 kΩ	0.12% + 2400 Ω	0.25% + 1 kΩ	0.25% + 1 kΩ	0.05% + 500 Ω
200.000 MΩ ⁴	1 kΩ	100 nA	–	0.66% + 10 kΩ	0.66% + 24 kΩ	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	0.35% + 5000 Ω
>200.000 MΩ ⁴	1 MΩ	–	–	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Source I _{ACC} + Meas. V _{ACC}	Meas. I _{ACC} + Meas. V _{ACC}

TEMPERATURE COEFFICIENT (0°–18°C & 28°–50°C): ±(0.15 × accuracy specification)/°C.

SOURCE I MODE, MANUAL OHMS: Total uncertainty = I source accuracy + V measure accuracy (4-wire remote sense).

SOURCE V MODE: Total uncertainty = V source accuracy + I measure accuracy (4-wire remote sense).

6-WIRE OHMS MODE: Available using active ohms guard and guard sense. Max. Guard Output Current: 50mA (except 1A range). Accuracy is load dependent. Refer to manual for calculation formula.

GUARD OUTPUT IMPEDANCE: 0.1Ω in ohms mode.

¹ Speed = Normal (1 PLC). For 0.1 PLC, add 0.005% of range to offset specifications, except 200mV, 1A, 10A ranges, add 0.05%. For 0.01 PLC, add 0.05% of range to offset specifications, except 200mV, 1A, 10A ranges, add 0.5%.

² Accuracies apply to 2- or 4-wire mode when properly zeroed.

³ 4-wire mode.

⁴ Manual ohms only – except 2420, 2425, 2430 for 2Ω range and 2410 or 2400 for 200MΩ range.

⁵ Source readback enabled, offset compensation ON. Also available on 2410, 2420, 2425, and 2430 with similar accuracy enhancement.

⁶ 10A range only in pulse mode.

⁷ In pulse mode, limited to 0.1 PLC measurement.

Contact Check Specifications

(Full SourceMeter specifications are published separately.)

SPEED: 350µs for verification and notification.

CONTACT CHECK:	2Ω	15Ω	50Ω
No contact check failure	<1.00Ω	<13.5Ω	<47.5Ω
Always contact check failure	>3.00Ω	>16.5Ω	>52.5Ω

QUESTIONS?

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

Call toll free for technical assistance, product support or ordering information, or visit our website at www.keithley.com.

2400, 2410, 2420, 2425, and 2430 SourceMeter® Line

SYSTEM SPEEDS

MEASUREMENT¹

MAXIMUM RANGE CHANGE RATE: 75/second.

MAXIMUM MEASURE AUTORANGE TIME: 40ms (fixed source)².

SWEEP OPERATION³ READING RATES (rdg./second) FOR 60Hz (50Hz):

SPEED	NPLC/TRIGGER ORIGIN	MEASURE		SOURCE-MEASURE		SOURCE-MEASURE PASS/FAIL TEST ⁴		SOURCE-MEMORY ⁴	
		TO MEM.	TO GPIB	TO MEM.	TO GPIB	TO MEM.	TO GPIB	TO MEM.	TO GPIB
Fast	0.01 / internal	2125 (2010)	1000 (1000)	1675 (1590)	900 (900)	1000 (990)	760 (760)	200 (185)	200 (185)
	0.01 / external	1275 (1220)	910 (920)	1080 (1045)	830 (835)	940 (910)	710 (710)	195 (180)	195 (180)
Medium	0.10 / internal	510 (435)	510 (435)	475 (410)	475 (410)	400 (355)	400 (355)	155 (140)	155 (140)
	0.10 / external	440 (380)	440 (380)	415 (365)	415 (365)	390 (345)	390 (345)	150 (135)	150 (135)
Normal	1.00 / internal	59 (49)	59 (49)	58 (48)	58 (48)	57 (48)	57 (48)	46 (39)	46 (39)
	1.00 / external	57 (48)	57 (48)	57 (47)	57 (47)	56 (47)	56 (47)	46 (39)	46 (39)

SINGLE READING OPERATION READING RATES (rdg./second) for 60Hz (50Hz):

SPEED	NPLC/TRIGGER ORIGIN	MEASURE	SOURCE-MEASURE ⁵	SOURCE-MEASURE PASS/FAIL TEST ^{4,5}
		TO GPIB	TO GPIB	TO GPIB
Fast	0.01 / internal	200 (200)	65 (65)	65 (65)
Medium	0.10 / internal	160 (150)	60 (60)	60 (58)
Normal	1.00 / internal	46 (40)	31 (28)	30 (28)

COMPONENT HANDLER INTERFACE TIME:^{4,6}

SPEED	NPLC/TRIGGER ORIGIN	MEASURE PASS/FAIL TEST	SOURCE PASS/FAIL TEST	SOURCE-MEASURE PASS/FAIL TEST ⁷
Fast	0.01 / external	1.07 ms (0.95 ms)	0.5 ms (0.5 ms)	4.0 ms (4.0 ms)
Medium	0.10 / external	2.8 ms (2.75 ms)	0.5 ms (0.5 ms)	5.5 ms (5.75 ms)
Normal	1.00 / external	20.85 ms (20.75 ms)	0.5 ms (0.5 ms)	20.5 ms (24 ms)

¹ Reading rates applicable for voltage or current measurements. Auto zero off, autorange off, filter off, display off, trigger delay = 0, and binary reading format.

² Purely resistive load. 1µA and 10µA ranges <65ms.

³ 1000 point sweep was characterized with the source on a fixed range.

⁴ Pass/Fail test performed using one high limit and one low math limit.

⁵ Includes time to re-program source to a new level before making measurement.

⁶ Time from falling edge of START OF TEST signal to falling edge of END OF TEST signal.

⁷ Command processing time of :SOURCE:VOLTage|CURRENT:TRIGgered <nrf> command not included.

GENERAL

NOISE REJECTION:

	NPLC	NMRR	CMRR
Fast	0.01	—	80 dB
Medium	0.1	—	80 dB
Normal	1	60 dB	120 dB ¹

¹ Except lowest 2 current ranges = 90dB.

LOAD IMPEDANCE: Stable into 20,000pF typical.

COMMON MODE VOLTAGE: 250V DC.

COMMON MODE ISOLATION: >10⁶Ω, <1000pF.

OVERANGE: 105% of range, source and measure.

MAX. VOLTAGE DROP BETWEEN INPUT/OUTPUT AND SENSE TERMINALS: 5V.

MAX. SENSE LEAD RESISTANCE: 1MΩ for rated accuracy.

SENSE INPUT IMPEDANCE: >10¹⁰Ω.

GUARD OFFSET VOLTAGE: >150µV, typical (300µV for Model 2430).

SOURCE OUTPUT MODES:

- Pulse (Model 2430 only)
- Fixed DC level
- Memory List (mixed function)
- Stair (linear and log)

SOURCE MEMORY LIST: 100 points max.

MEMORY BUFFER: 5,000 readings @ 5 digits (two 2,500 point buffers). Includes selected measured value(s) and time stamp. Lithium battery backup (3 yr + battery life).

PROGRAMMABILITY: IEEE-488 (SCPI-1995.0), RS-232, 5 user-definable power-up states plus factory default and *RST.

DIGITAL INTERFACE:

Safety Interlock: Active low input.

Handler Interface: Start of test, end of test, 3 category bits. +5V@ 300mA supply.

Digital I/O: 1 trigger input, 4 TTL/Relay Drive outputs (33V @ 500mA, diode clamped).

POWER SUPPLY: 88V to 264V rms, 50–60Hz (automatically detected at power up).
Model 2400: 190VA. **Model 2410:** 210VA. **Model 2420:** 220VA. **Model 2425, 2430:** 250VA.

COOLING: (Model 2410, 2420, 2425, 2430): Forced air, variable speed.

WARRANTY: 1 year.

EMC: Conforms to European Union Directive 89/336/EEC.

SAFETY: Conforms to European Union Directive 73/23/EEC (meets EN61010-1/IEC 1010).

VIBRATION: MIL-T-28800E Type III, Class 5.

WARM-UP: 1 hour to rated accuracies.

DIMENSIONS: 89mm high × 213mm wide × 370mm deep (3½ in × 8½ in × 14½ in).
Bench Configuration (with handle & feet): 104mm high × 238mm wide × 370mm deep (4½ in × 9½ in × 14½ in).

WEIGHT: 3.21kg (7.08 lbs) (Model 2425, 2430: 4.1kg, 9.0 lbs).

ENVIRONMENT:

Operating: 0°–50°C, 70%R.H. up to 35°C. Derate 3% R.H./°C, 35°–50°C.

Storage: –25°C to 65°C.

ACCESSORIES SUPPLIED: Model 1754 Universal Test Lead Kit, User's Manual, Service Manual, LabVIEW and TestPoint Drivers.

Specifications subject to change without notice.

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