2470 Graphical SourceMeter® SMU Instrument

Datasheet

The 2470 High Voltage SourceMeter® Source Measure Unit (SMU) Instrument brings advanced Touch, Test, Invent® technology right to your fingertips. It combines an innovative graphical user interface (GUI) with capacitive touchscreen technology to make testing intuitive and minimize the learning curve to help engineers and scientists learn faster, work smarter, and invent easier. With its 1100 V and 10 fA capability, the 2470 is optimized for characterizing and testing high voltage, low leakage devices, materials, and modules, such as silicon carbide (SiC), gallium nitride (GaN), power MOSFETs, transient suppression devices, circuit protection devices, power modules, batteries, and much more. These new capabilities, combined with Keithley's decades of expertise in developing high precision, high-accuracy SMU instruments, make the 2470 a "go-to instrument" for high-voltage source and low-current measurement applications in the lab and in the test rack.

Key Features

- Wide coverage up to 1100 V / 1 A DC 20 W max.
- 10 fA measure resolution
- 0.012% basic measure accuracy with 6½-digit resolution
- Five-inch, high resolution capacitive touch screen GUI
- Source and sink (4-quadrant) operation
- SCPI and TSP® scripting programming modes
- TSP-Link for multi-channel I-V testing
- Front panel input banana jacks; rear panel high-voltage input triaxial connections
- Built-in context-sensitive help
- Front-panel USB 2.0 memory I/O port for transferring data, test scripts, and test configurations

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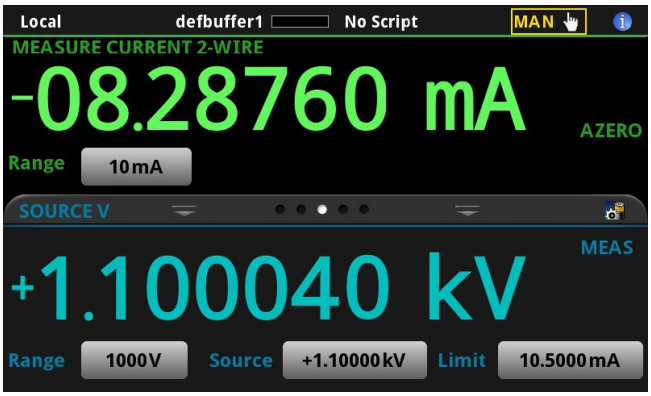
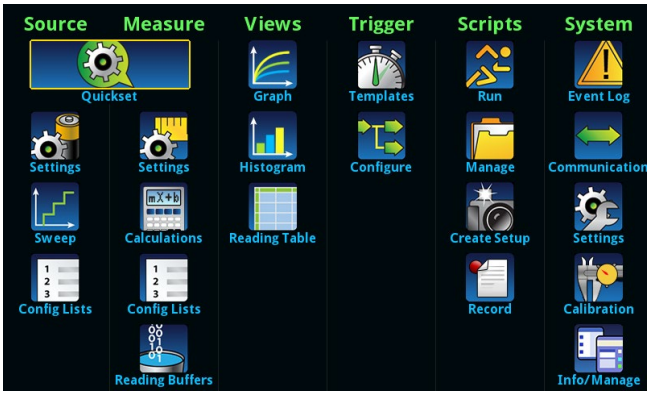
Tektronix®

Learn Faster; Work Smarter; Invent Easier

The 2470 features a five-inch, full-color, high resolution touchscreen that supports intuitive operation, helps operators become familiar with the instrument quickly, and optimizes overall speed and productivity. A simple icon-based menu structure reduces the number of steps required to configure a test by as much as 50 percent and eliminates the cumbersome multi-layer menu structures typically used on soft-key instruments. Built-in, context-sensitive help supports intuitive operation and minimizes the need to review a separate manual. These capabilities, combined with the 2470's high versatility, simplify its operation in both basic and advanced measurement applications, regardless of the user's previous experience in working with SMU instruments.



2470 main home screen.

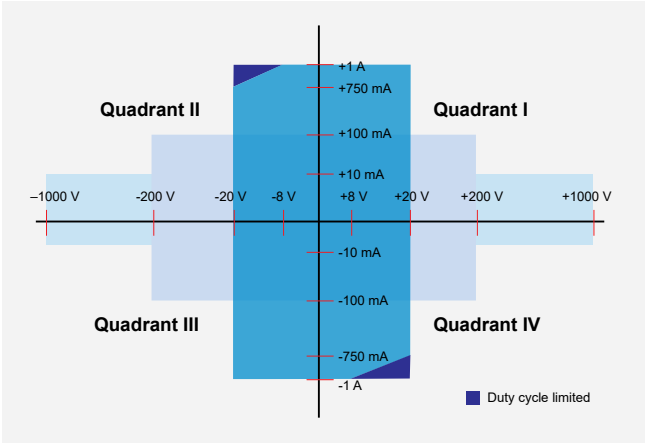


2470 icon-based menu.

All-in-One SMU Instrument

The 2470, Keithley's fourth generation of SourceMeter SMUs, leverages the proven capabilities of the original 2410 High Voltage SourceMeter SMU Instrument. SMU instruments offer a highly flexible, four-quadrant voltage and current source/load coupled with precision voltage and current measurements. This all-in-one instrument has the capabilities of a:

- Precision power supply with V and I readback
- True current source
- Digital multimeter (DCV, DCI, ohms, and power with 6½-digit resolution)
- Precision electronic load
- Trigger controller



2470 power envelope.

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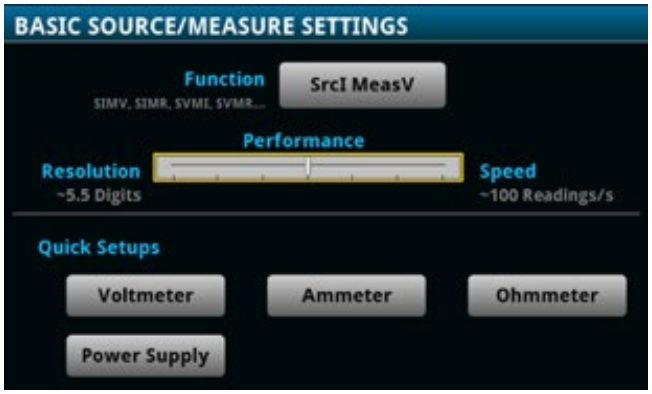
2470 front panel with high-resolution, capacitive touchscreen.

Ease of Use Beyond the Touchscreen

In addition to its five-inch color touchscreen, the 2470 front panel offers a variety of features that enhance its speed, user-friendliness, and learnability, including a USB 2.0 memory I/O port, a HELP key, a rotary navigation/control knob, a front/rear input terminal selector button, and banana jacks for basic bench applications. The USB 2.0 memory port simplifies storing test results and instrument configurations, uploading test scripts into the instrument, and installing system upgrades. All front-panel buttons are backlit to enhance visibility in low-light environments.

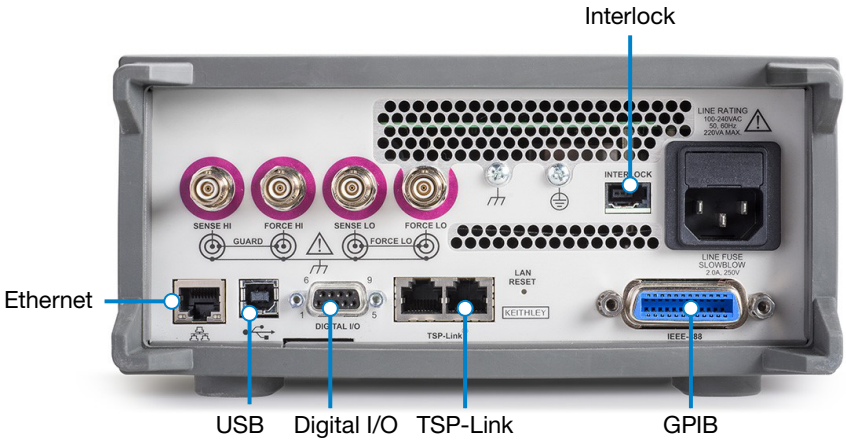
Four Quick Setup modes simplify instrument setup. With one touch, the instrument can be quickly configured for various operating modes without the need to configure the instrument indirectly for this operation.



One-touch Quickset modes speed measurement setups and minimize the time to measurements.

Comprehensive Built-in Connectivity

Rear panel access to rear-input connectors, remote control interfaces (GPIB, USB 2.0, and LXI/Ethernet), a D-sub 9-pin digital I/O port (for internal/external trigger signals and handler control), instrument interlock connector, and TSP-Link® connectors make it simple to configure multiple instrument test solutions and eliminate the need to invest in additional adapter accessories.



Rear panel connections are optimized for signal integrity and speed system setup.

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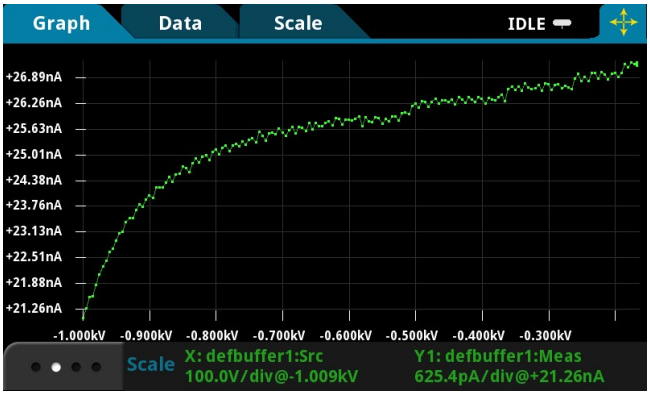
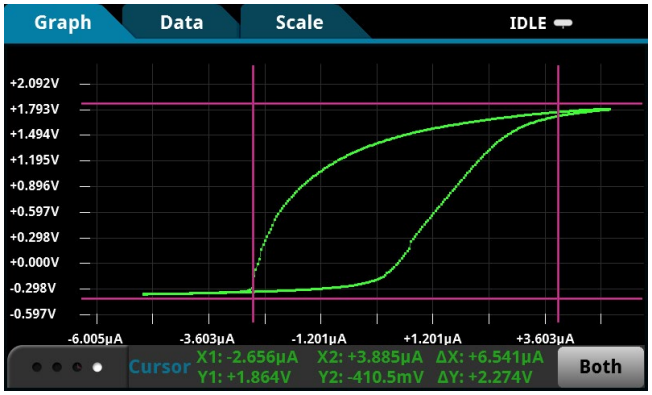
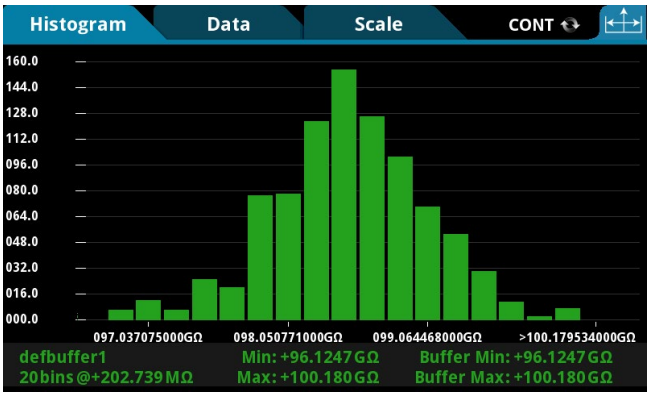
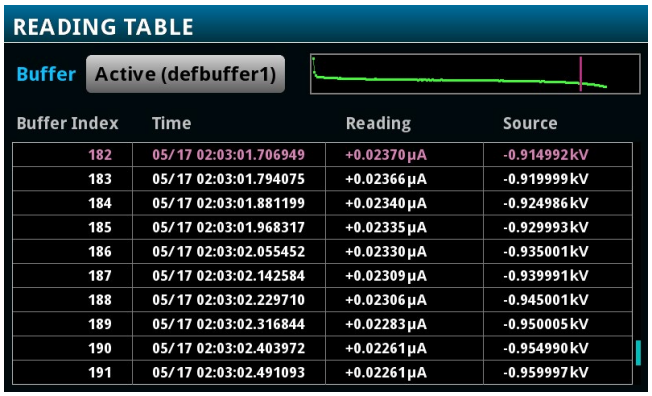
Convert Raw Data to Information

A full graphical plotting window converts raw data and displays it immediately as useful information, such as semiconductor I-V curves and waveforms. Using the 2470's Sheet view, test data can also be displayed in tabular form. The instrument supports exporting data to a spreadsheet for further analysis, dramatically improving productivity for research, benchtop testing, device qualification, and debugging.







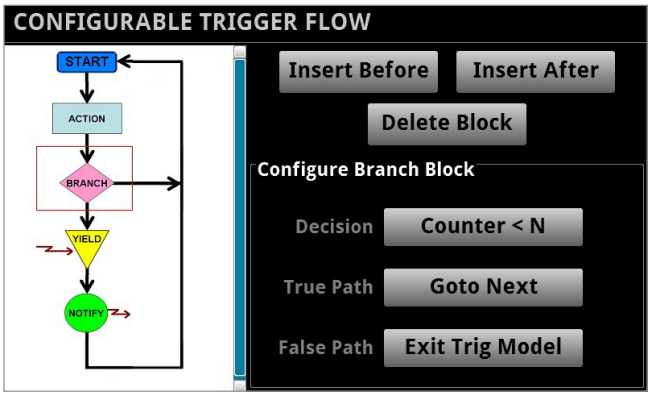


Built-in data display, charting, and spreadsheet export functions simplify converting test results into useful information.

TriggerFlow® Building Blocks for Instrument Control and Execution

The 2470 incorporates Keithley's TriggerFlow triggering system, which provides user control of instrument execution. TriggerFlow diagrams are created in much the same way that flow charts are developed, using four building blocks:

- Wait – Waits for an event to occur before the flow continues
- Branch – Branches when a condition has been satisfied
- Action – Initiates an action in the instrument, for example, measure, source, delay, set digital I/O, etc.
- Notify – Notifies other equipment that an event has occurred



TriggerFlow building blocks allow creating triggering models that range from very simple to highly complex.

A TriggerFlow model using a combination of these building blocks can be created from the front panel or by sending remote commands. With the TriggerFlow system, users can build triggering models from very simple to complex with up to 255 block levels. The 2470 also includes basic triggering functions, including immediate, timer, and manual triggering.

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Unmatched System Integration and Programming Flexibility

When a 2470 is configured into a multi-channel I-V test system, its embedded Test Script Processor (TSP®) allows it to run test scripts, so users can create powerful measurement applications with significantly-reduced development times. TSP technology also offers channel expansion without a mainframe. Keithley's TSP-Link® channel expansion bus can connect multiple 2470s and other TSP instruments, including Keithley's other graphical SourceMeter instruments (2450, 2460, 2461), Keithley's DMM7510, DMM6500, and DAQ6510 graphical multimeters, Series 2600B System SourceMeter SMU instruments, and Series 3700A Switch/Multimeter systems, in a master-subordinate configuration that operates as one integrated system. The TSP-Link expansion bus supports up to 32 units per GPIB or IP address, making it easy to scale a system to fit an application's particular requirements.

Parallel Test Capability

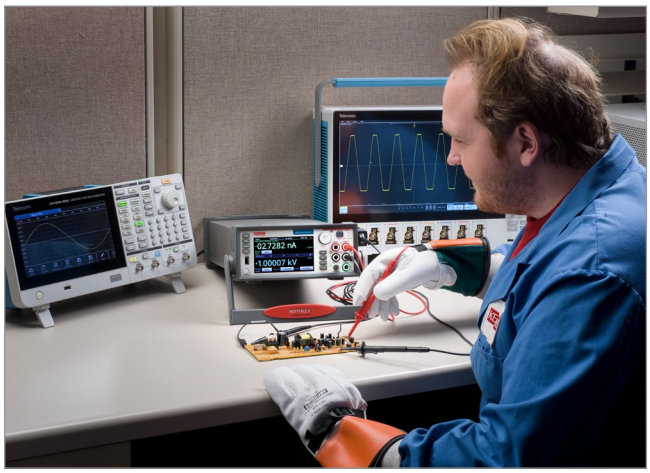
The TSP technology in the 2470 supports testing multiple devices in parallel to meet the needs of device research, advanced semiconductor lab applications, and even high throughput production test. This parallel testing capability allows each instrument in the system to run its own complete test sequence, creating a fully multi-threaded test environment. The number of tests that can be run in parallel on a graphical SourceMeter can be as high as the number of instruments in the system.

Typical Applications

Ideal for current/voltage characterization and functional test of a wide range of today's modern electronics and devices, including:

- Devices
  - Power semiconductors and materials: SiC, GaN, power MOSFETs, power diodes
  - IGBT
  - Thyristors, SCRs
  - Transient suppression devices
  - Circuit protection devices: TVS, MOVs, fuses, etc.
  - Connectors, switches, relays
  - Power management modules
  - Batteries
- Tests
  - I-V characterization
  - Forward voltage
  - Breakdown voltage
  - Leakage current
  - Isolation
  - Hi-Pot
  - Dielectric withstanding

Characterize transistors with multiple SMU instruments on wafer or packaged transistors



The 2470 is the ideal addition to your development bench for designing today's high power devices and components.

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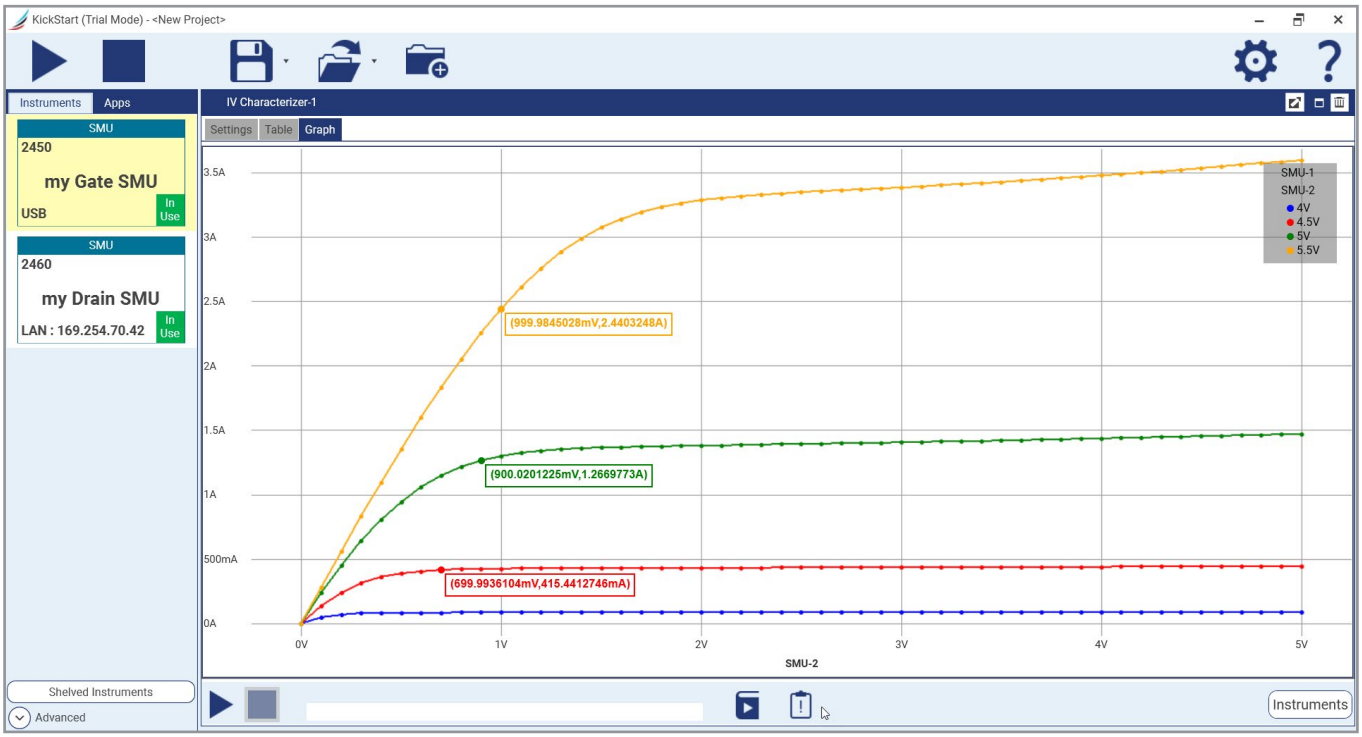
Instrument Control Start-up Software

KickStart instrument control/start-up software enables users to start making measurements in minutes without programming. In most cases, users merely need to make some quick measurements, graph the data, and store the data to disk for later analysis in software environments such as Excel. KickStart offers:

- Instrument configuration control to perform I-V characterization
- Native X-Y graphing, panning, and zooming
- Spreadsheet/tabular viewing of data
- Saving and exporting of data for further analysis
- Saving of test setups
- Screenshot capturing of graphs
- Annotating of tests
- Command line dialog for sending and receiving data
- HTML help
- GPIB, USB 2.0, Ethernet compliance

Simplified Programming with Ready-to-Use Instrument Drivers

For those who prefer to create their own customized application software, native National Instruments LabVIEW® drivers, and IVI-C and IVICOM drivers are available at tek.com/keithley.



KickStart start-up software lets users be ready to make measurements in minutes.

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Specifications

Voltage Specifications [1, 2]

	Source			Measure [3]		
Range [4]	Resolution	Accuracy [5] 23 °C ± 5 °C, 1 Year ±(% setting + volts)	Noise (RMS) <10 Hz	Resolution	Input Resistance	Accuracy 23 °C ± 5 °C, 1 Year ±(% reading + volts)
200.0000 mV	5 µV	0.015% + 200 µV	2 µV	100 nV	> 10 GΩ	0.012% + 200 µV
2.000000 V	50 µV	0.020% + 300 µV	10 µV	1 µV	> 10 GΩ	0.012% + 300 µV
20.00000 V	500 µV	0.015% + 2.4 mV	100 µV	10 µV	> 10 GΩ	0.015% + 1 mV
200.0000 V	5 mV	0.015% + 24 mV	1 mV	100 µV	> 10 GΩ	0.015% + 10 mV
1000.000 V	50 mV	0.02% + 100 mV	20 mV	10 mV	> 10 GΩ	0.015% + 50 mV

Temperature Coefficient ± (0.15 × accuracy specification)/°C, 0 °C to 18 °C and 28 °C to 50 °C

Current Specifications [1, 2]

	Source			Measure [3]		
Range [4]	Resolution	Accuracy [5] 23 °C ± 5 °C, 1 Year ±(% setting + amps)	Noise (RMS) <10 Hz	Resolution	Voltage Burden	Accuracy 23 °C ± 5 °C, 1 Year ±(% reading + amps)
10.00000 nA [6]	500 fA	0.100% + 200 pA	500 fA	10 fA	< 100 µV	0.10% + 250 pA
100.0000 nA [6]	5 pA	0.060% + 250 pA	500 fA	100 fA	< 100 µV	0.060% + 300 pA
1.000000 µA	50 pA	0.025% + 400 pA	5 pA	1 pA	< 100 µV	0.025% + 300 pA
10.00000 µA	500 pA	0.025% + 1.5 nA	40 pA	10 pA	< 100 µV	0.025% + 700 pA
100.0000 µA	5 nA	0.020% + 15 nA	400 pA	100 pA	< 100 µV	0.02% + 6 nA
1.000000 mA	50 nA	0.020% + 150 nA	5 nA	1 nA	< 100 µV	0.02% + 60 nA
10.00000 mA	500 nA	0.020% + 1.5 µA	40 nA	10 nA	< 100 µV	0.02% + 600 nA
100.0000 mA	5 µA	0.025% + 15 µA	100 nA	100 nA	< 100 µV	0.025% + 6 µA
1.000000 A	50 µA	0.067% + 900 µA	10 µA	1 µA	< 100 µV	0.03% + 500 µA

Temperature Coefficient ± (0.15 × accuracy specification)/°C, 0 °C to 18 °C and 28 °C to 50 °C

Notes

1. Speed = 1 PLC.
2. All specifications are guaranteed with output ON.
3. Accuracies apply to 2-wire and 4-wire modes when properly zeroed. For the 200 mV and 1 A ranges, the voltage burden may exceed the specification in 2-wire mode.
4. Maximum display and programmming ranges are 5% overrange for voltage, except for the 1000 V range, which is 10% overrange (1100 V), and 5% overrange for current (for example, 1.05 A on the 1 A range).
5. For sink mode, accuracy is ±(0.15% + offset × 4) except for 1 A range, accuracy is: ± (1.5% + offset × 8).
6. Rear-panel triaxial connections only.

Resistance Measurement Accuracy (Local Or Remote Sense) [7, 8, 9]

Range	Default Resolution [10]	Default Test Current	Normal Accuracy 23 °C ± 5 °C, 1 Year ± (% reading + ohms)	Enhanced Accuracy [11] 23 °C ± 5 °C, 1 Year ± (% reading + ohms)
< 2.000000 Ω [12]	1 µΩ	User-defined	Source I_{ACC} + Meas V_{ACC}	Meas I_{ACC}C + Meas V_{ACC}
20.00000 Ω	10 µΩ	100 mA	0.098% + 0.003 Ω	0.073% + 0.001 Ω
200.0000 Ω	100 µΩ	10 mA	0.077% + 0.03 Ω	0.053% + 0.01 Ω
2.000000 kΩ	1 mΩ	1 mA	0.066% + 0.3 Ω	0.045% + 0.1 Ω
20.00000 kΩ	10 mΩ	100 µA	0.063% + 3 Ω	0.043% + 1 Ω
200.0000 kΩ	100 mΩ	10 µA	0.065% + 30 Ω	0.046% + 10 Ω
2.000000 MΩ	1 Ω	1 µA	0.11% + 300 Ω	0.049% + 100 Ω
20.00000 MΩ	10 Ω	1 µA	0.11% + 1 kΩ	0.052% + 500 Ω
200.0000 MΩ [13]	100 Ω	100 nA	0.655% + 10 kΩ	0.349% + 5 kΩ
> 200.0000 MΩ [12, 13]	—	User-defined	Source I_{ACC} + Meas V_{ACC}	Meas I_{ACC} + Meas V_{ACC}

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Temperature Coefficient	± (0.15 × accuracy specification)/°C 0 °C to 18 °C and 28 °C to 50 °C
Source Current, Measure Resistance Mode	Total uncertainty = I source accuracy + V measure accuracy (4-wire remote sense)
Source Voltage, Measure Resistance Mode	Total uncertainty = V source accuracy + I measure accuracy (4-wire remote sense)
Guard Output Impedance	≥ 300 Ω typical

Notes

7. Speed = 1 PLC.
8. All specifications are guaranteed with output ON.
9. Accuracies apply to 2-wire and 4-wire modes when properly zeroed.
10. Measure resolution 6.5 digits.
11. Source readback enabled; offset compensation on.
12. Source current, measure resistance or source voltage, measure resistance only.
13. Rear-panel triaxial connections only.

Supplemental Specifications

Overrange	105% of range for 200 mV to 200 V, source and measure ranges; 110% of range for 1000 V, source and measure ranges
Regulation	
Voltage	**Line:** 0.01% of range **Load:** 0.01% of range + 100 µV
Current	**Line:** 0.01% of range **Load:** 0.01% of range + 100 pA
Source Limits	
Voltage Source Current Limit	Bipolar current limit set with a single value Minimum value is 10% of range
Current Source Voltage Limit	Bipolar voltage limit set with a single value Minimum value is 10% of range
Voltage Limit/Current Limit Accuracy	Add 0.3% of range and ±0.02% of reading to base specification
Overshoot	
Voltage Source	< 0.1% typical Step size = Full scale, resistive load, 20 V range, 10 mA current limit
Current Source	< 0.1% typical Step size = Full scale, resistive load of 10 kΩ, 1 mA range, 20 V voltage limit
Range Change Overshoot	Overshoot into a fully resistive 100 kΩ load, 10 Hz to 20 MHz bandwidth, adjacent ranges: 250 mV typical
Output Settling Time	Time required to reach within 0.1% of final value: 20 V range, 100 mA current limit: < 200 µs typical
Maximum Slew Rate [14]	0.2 V/µs, 200 V range, 100 mA limit into a 2 kΩ load (typical) 0.5 V/µs, 1000 V range, 10 mA limit into a 100 kΩ load (typical)
Overvoltage Protection	User-selectable values, 10% tolerance; factory default = none
Voltage Source Noise	10 Hz to 20 MHz (RMS): 4 mV typical into a resistive load
Common Mode Voltage	250 V DC
Common Mode Isolation	> 1 GΩ, < 1000 pF

Notes

14. High capacitance mode off.

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Noise Rejection (typical)

NPLC	NMRR	CMRR
0.01	—	60 dB
0.1	—	60 dB
1	60 dB	100 dB*
* Except 10 nA and 100 nA current ranges ~90 dB		

Load Impedance

Normal Mode	20 nF typical
High-Capacitance Mode	Stable into 1 µF typical (specification only valid for ranges ≥100 µA)

Maximum Voltage Drop Between Force and Sense Terminals
5 V

Maximum Sense Lead Resistance 1 MΩ for rated accuracy

Sense Input Impedance > 10 GΩ

Guard Offset Voltage < 300 µV typical

System Measurement Speeds [15]

Reading rates (readings per second) typical for 60 Hz (50 Hz), script (TSP) programmed

NPLC	Trigger Origin	Measure to Memory	Measure to GPIB	Measure to USB	Measure to LAN	Source Measure Sweep to Memory	Source measure sweep to GPIB	Source Measure Sweep to USB	Source Measure Sweep to LAN
0.01	Internal	3150 (2800)	2760 (2570)	2825 (2570)	2740 (2530)	1710 (1620)	1620 (1540)	1630 (1540)	1620 (1540)
0.01	External	2170 (2050)	2120 (2003)	2170 (2010)	2100 (1990)	1670 (1590)	1580 (1500)	1590 (1510)	1580 (1510)
0.10	Internal	540 (460)	530 (450)	530 (450)	530 (450)	470 (410)	460 (400)	470 (400)	470 (400)
0.10	External	500 (430)	490 (420)	500 (425)	480 (420)	450 (400)	460 (390)	460 (390)	410 (350)
1.00	Internal	59 (49)	58 (49)	59 (49)	59 (49)	58 (48)	58 (48)	58 (48)	57 (48)
1.00	External	58 (48)	57 (48)	58 (48)	58 (48)	57 (48)	57 (48)	57 (48)	55 (48)

Reading rates (readings per second) typical for 60 Hz (50 Hz), SCPI programmed [16]

NPLC	Trigger Origin	Measure to Memory	Measure to GPIB	Measure to USB	Measure to LAN	Source Measure Sweep to memory	Source Measure Sweep to GPIB	Source Measure Sweep to USB	Source Measure Sweep to LAN
0.01	Internal	3040 (2800)	3000 (2760)	3000 (2760)	3010 (2710)	1710 (1630)	1610 (1544)	1440 (1380)	1690 (1590)
0.01	External	2320 (2165)	2290 (2140)	2340 (2150)	2290 (2130)	1680 (1590)	1560 (1525)	1410 (1360)	1660 (1560)
0.10	Internal	540 (460)	540 (450)	540 (460)	540 (450)	470 (410)	470 (410)	450 (390)	470 (410)
0.10	External	510 (440)	510 (430)	510 (440)	510 (430)	470 (400)	470 (400)	450 (390)	470 (400)
1.00	Internal	59 (49)	59 (49)	59 (49)	59 (49)	58 (48)	58 (48)	57 (48)	58 (48)
1.00	External	58 (49)	58 (49)	58 (49)	58 (49)	58 (48)	58 (48)	57 (47)	58 (48)

Notes

15. Reading rates applicable for voltage or current measurements, autozero off, autorange off, filter off, binary reading format, and source readback off.
16. SCPI programming mode.

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General Characteristics

(Default mode unless specified)

Factory Default Standard Power-Up Setting	SCPI mode
Source Output Modes	Fixed DC level Memory/configuration list (mixed function) Stair (linear and logarithmic)
Memory Buffer	>5,000,000 readings with selected measured values and timestamp
Real-Time Clock	Lithium battery backup (more than 3 years of battery life)
Remote Interfaces	**GPIB:** IEEE Std 488.1 compliant; supports IEEE Std 488.2 common commands and status model topology **USB device (rear panel, type B):** 2.0 full-speed USBTMC **USB host (front panel, type A):** USB 2.0, support for flash drives, FAT32 **Ethernet:** RJ-45 connector, 10/100 BT
IP Configuration	Static or DHCP
Expansion Interface	The TSP-Link® expansion interface allows TSP-enabled instruments to trigger and communicate with each other
LXI Compliance	LXI version 1.4 Core 2011
TSP Mode	Embedded Test Script Processor (TSP) accessible from any host interface
Display	Five-inch capacitive touch, color TFT WVGA (800 × 480) with LED backlight
Input Signal Connections	**Front:** Banana. **Rear:** High-voltage triaxial
Programmability	SCPI or TSP command sets
Interlock	Active high-input
Digital I/O	**Lines:** Six input/output, user-defined, for digital I/O or triggering **Connector:** 9-pin female D **Input Signal Levels:** 0.7 V (maximum logic low), 3.7 V (minimum logic high) **Input Voltage Limits:** –0.25 V (absolute minimum), +5.25 V (absolute maximum) **Maximum Source Current:** +2.0 mA at > 2.7 V (per pin) **Maximum Sink Current:** –50 mA at 0.7 V (per pin, solid-state fuse protected) **5 V Power Supply Pin:** Limited to 500 mA at > 4 V (solid-state fuse protected) **Handler:** User-definable start of test, end of test, four category bits
Cooling	Forced air, variable speed
Overtemperature Protection	Internally sensed temperature overload puts instrument in standby mode
Power Supply	100 VRMS to 240 VRMS, 50 Hz or 60 Hz (automatically detected at power up)
VA Rating	220 VA maximum
Altitude	Maximum 2000 meters (6562 feet) above sea level
EMC	Conforms to European Union EMC Directive
Safety	NRTL listed to UL61010-1 and UL61010-2-30; conforms to European Union Low Voltage Directive
RoHS	Conforms to European Union Restriction on Hazardous Substances Directive
Vibration	MIL-PRF-28800F Class 3 Random
Warm up	One hour to rated accuracies

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Dimensions	**With handle and bumpers:** 106 mm × 255 mm × 425 mm (4.18 in. high × 10.05 in. wide × 16.75 in. deep)
	Without handle and bumpers: 88 mm × 213 mm × 403 mm (3.46 in. high × 8.39 in. wide × 15.87 in. deep)
Weight	**With handle and bumpers:** 4.54 kg (10 lb)
	Without handle and bumpers: 4.08 kg (9.0 lb)
Environment	**Operating:** 0 °C to 50 °C, 70% relative humidity up to 35 °C; derate 3% relative humidity/°C, 35 °C to 50 °C
	Storage: –25 °C to 65 °C
	Pollution Category: 2

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Supplied Accessories

8608	High Performance Test Leads
USB-B-1	USB Cable, Type A to Type B, 1 m (3.3 ft)
CS-1616-3	Safety Interlock Mating Connector
17469460X	TSP-Link/Ethernet Cable
	2470 QuickStart Guide
	Test Script Builder Software (available at www.tektronix.com)
	LabVIEW and IVI Drivers (available at www.tektronix.com)

Available Accessories

Test Leads and Probes

8605	High Performance Modular Test Leads
8606	High Performance Modular Probe Kit
8608	High Performance Test Leads

Cables, Connectors, Adapters

TRX-1100V-BAN	HV Triax to Banana Adapter. Converts the 4 triax connectors on the rear panel to 5 banana jacks
TRX-1100V-*	3-slot HV Low Noise Triax Cable (0.5 m, 1 m, 2 m, 3 m lengths available)
8607	2-wire, 1000 V Banana Cables, 1 m (3.3 ft)
CS-1616-3	Safety Interlock Mating Connector

Communication Interfaces & Cables

7007-1	Shielded GPIB Cable, 1 m (3.3 ft)
7007-2	Shielded GPIB Cable, 2 m (6.6 ft)
17469460X	TSP-Link Ethernet Cable
KPCI-488LPA	IEEE-488 Interface for PCI Bus
KUSB-488B	IEEE-488 USB-to-GPIB Interface Adapter
USB-B-1	USB Cable, Type A to Type B, 1 m (3.3 ft)

服务热线：400-806-2189

Triggering and Control

2450-TLINK	DB-9 to Trigger Link Connector Adapter
8501-1	Trigger Link Cable, DIN-to-DIN, 1 m (3.3 ft.)
8501-2	Trigger Link Cable, DIN-to-DIN, 2 m (6.6 ft.)

Rack Mount Kits

4299-8	Single Fixed Rack Mount Kit
4299-9	Dual Fixed Rack Mount Kit
4299-10	Dual Fixed Rack Mount Kit. Mount one 2450 and one Series 26xxB
4299-11	Dual Fixed Rack Mount Kit. Mount one 2450 and one Series 2400, Series 2000, etc.

Available Services

2470-3Y-EW	1-year factory warranty extended to 3 years from date of shipment
2470-5Y-EW	1-year factory warranty extended to 5 years from date of shipment
C/2470-3Y-17025	KeithleyCare® 3 Year ISO 17025 Calibration Plan
C/2470-3Y-DATA	KeithleyCare 3 Year Calibration w/Data Plan
C/2470-3Y-STD	KeithleyCare 3 Year STD Calibration Plan
C/2470-5Y-17025	KeithleyCare 5 Year ISO 17025 Calibration Plan
C/2470-5Y-DATA	KeithleyCare 5 Year Calibration w/Data Plan
C/2470-5Y-STD	KeithleyCare 5 Year STD Calibration Plan
C/NEW DATA	Calibration Data for New Units
C/NEW DATA ISO	ISO-17025 Calibration Data for New Units

Ordering Information

2470	1000 V, 1 A, 20 W SourceMeter SMU Instrument

Warranty Information

Warranty Summary	This section summarizes the warranties of the 2470. For complete warranty information, refer to the Tektronix warranty page at https://www.tek.com/service/warranties/warranty-2. Any portion of the product that is not manufactured by Keithley is not covered by this warranty and Keithley will have no duty to enforce any other manufacturer's warranties.
Hardware Warranty	Keithley warrants the Keithley manufactured portion of the hardware for a period of one year from defects in materials or workmanship; provided that such defect has not been caused by use of the Keithley hardware which is not in accordance with the hardware instructions. The warranty does not apply upon any modification of Keithley hardware made by the customer or operation of the hardware outside the environmental specifications.
Software Warranty	Keithley warrants for the Keithley produced portion of the software or firmware will conform in all material respects with the published specifications for a period of ninety (90) days; provided the software is used on the product for which it is intended in accordance with the software instructions. Keithley does not warrant that operation of the software will be uninterrupted or error-free, or that the software will be adequate for the customer's intended application. The warranty does not apply upon any modification of the software made by the customer.

服务热线：400-806-2189