## Series 2600B System SourceMeter® SMU Instruments

**Built-in, Java-based test software enables true plug & play I/V characterization and test through any browser.**

The Series 2600B System SourceMeter SMU Instruments are the industry’s leading current/voltage source and measure solutions, and are built from Keithley’s 3rd generation SMU technology. The Series 2600B offers single- and dual-channel models that combine the capabilities of a Precision Power Supply, true Current Source, 6-1/2 digit DMM, Arbitrary Waveform Generator, Pulse Generator, and Electronic Load – all into one tightly integrated instrument. The result is a powerful solution that significantly boosts productivity in applications ranging from bench-top I/V characterization through highly-automated production test. For bench-top use, Series 2600B instruments feature built-in, Java-based software that enables plug & play I/V testing through any browser, on any computer, from anywhere in the world. For automated system applications, the Series 2600B’s Test Script Processor (TSP) runs complete test programs from inside the instrument for industry-best through-put. In larger, multi-channel applications, Keithley’s TSP-Link technology works together with TSP to enable high-speed, SMU-per-pin parallel testing. Because Series 2600B SourceMeter SMU Instruments have fully isolated channels that do not require a mainframe, they can be easily re-configured and re-deployed as your test applications evolve.

### Java-based Plug & Play I/V Test Software

The Series 2600B are the only SMU instruments to feature built-in, Java-based test software that enables true plug & play I/V characterization through any browser, on any computer, from anywhere in the world. This unique capability boosts productivity across a wide range of applications such as R&D, education, QA/FA, and more. Simply connect the 2600B to the internet via the supplied LAN cable, open a browser, type in the 2600B’s I.P. address, and begin testing. Resulting data can be downloaded to a spreadsheet such as Excel for further analysis and formatting, or for inclusion in other documents or presentations.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightly-integrated, 4-quadrant voltage/current source and measure instruments</td>
<td>Offer best in class performance with 6 ½ digit resolution</td>
</tr>
<tr>
<td>Family of models</td>
<td>Offer industry’s widest dynamic range: 10A pulse to 0.1fA and 200V to 100nV</td>
</tr>
<tr>
<td>Built-in, Java-based test software</td>
<td>Enables true plug &amp; play I/V characterization and test through any browser</td>
</tr>
<tr>
<td>TSP (Test Script Processing) technology</td>
<td>Embeds complete test programs inside the instrument for best-in-class system-level throughput</td>
</tr>
<tr>
<td>TSP-Link expansion technology</td>
<td>For multi-channel parallel test without a mainframe</td>
</tr>
<tr>
<td>Software emulation for Keithley’s Model 2400 SourceMeter SMU Instrument</td>
<td></td>
</tr>
<tr>
<td>USB 2.0, LXI-C, GPIB, RS-232, and digital I/O interfaces</td>
<td></td>
</tr>
<tr>
<td>Free software drivers and development/debug tools</td>
<td></td>
</tr>
<tr>
<td>Optional ACS-Basic semiconductor component characterization software</td>
<td></td>
</tr>
</tbody>
</table>
Ordering Information

2601B  Single-channel System SourceMeter Instrument (3A DC, 10A Pulse)
2602B  Dual-channel System SourceMeter Instrument (3A DC, 10A Pulse)
2604B  Dual-channel System SourceMeter Instrument (3A DC, 10A Pulse, Benchtop Version)
2611B  Single-channel System SourceMeter Instrument (200V, 10A Pulse)
2612B  Dual-channel System SourceMeter Instrument (200V, 10A Pulse)
2614B  Dual-channel System SourceMeter Instrument (200V, 10A Pulse, Benchtop Version)
2634B  Dual-channel System SourceMeter Instrument (0.1fA, 10A Pulse, Benchtop Version)
2635B  Single-channel System SourceMeter Instrument (0.1fA, 10A Pulse)
2636B  Dual-channel System SourceMeter Instrument (0.1fA, 10A Pulse)

Accessories Supplied

Operators and Programming Manuals
2600-ALG-2: Low Noise Triax Cable with Alligator Clips, 2m (6.6 ft.) (two supplied with 2634B and 2636B, one with 2635B)
2600-Kit: Mating Screw Terminal Connectors with strain relief and covers (2601B/2602B/2604B/2611B/2612B/2614B)
CA-180-3A: TSP-Link/Ethernet Cable (two per unit)
TSP Express Software Tool (embedded)
Test Script Builder Software (supplied on CD)
LabVIEW Driver
ACS Basic Edition Software (optional)

Unmatched Throughput for Automated Test with TSP Technology

For test applications that demand the highest levels of automation and throughput, the Model 2600B's TSP technology delivers industry-best performance. TSP technology goes far beyond traditional test command sequencers...it fully embeds then executes complete test programs from within the SMU instrument itself. This virtually eliminates all the time-consuming bus communications to and from the PC controller, and thus dramatically improves overall test times.

SMU-Per-Pin Parallel Testing with TSP-Link Technology

TSP-Link is a channel expansion bus that enables multiple Series 2600B's to be inter-connected and function as a single, tightly-synchronized, multi-channel system. The 2600B's TSP-Link technology works together with its' TSP technology to enable high-speed, SMU-per-pin parallel testing. Unlike other high-speed solutions such as large ATE systems, the 2600B achieves parallel test performance without the cost or burden of a mainframe. The TSP-Link based system also enables superior flexibility, allowing for quick and easy system re-configuration as test requirements change.

Model 2400 Software Emulation

The Series 2600B is compatible with test code developed for Keithley's Model 2400 SourceMeter SMU instrument. This enables an easier upgrade from Model 2400-based test systems to Series 2600B, and can improve test speeds by as much as 80%. In addition, it provides a migration path from SCPI programming to Keithley's TSP technology, which when implemented can improve test times even more. For complete support of legacy test systems, the Model 2400's Source-Memory-List test sequencer is also fully supported in this mode.

Third-generation SMU Instrument Design Ensures Faster Test Times

Based on the proven architecture of earlier Series 2600 instruments, the Series 2600B's SMU instrument design enhances test speed in several ways. For example, while earlier designs used a parallel current ranging topology, the Series 2600B uses a patented series ranging topology, which provides faster and smoother range changes and outputs that settle more quickly.

SMU-Per-Pin Parallel Testing using TSP and TSP-Link improves test throughput and lowers the cost of test.
The Series 2600B SMU instrument design supports two modes of operation for use with a variety of loads. In normal mode, the SMU instrument provides high bandwidth performance for maximum throughput. In high capacitance (high-C) mode, the SMU instrument uses a slower bandwidth to provide robust performance with higher capacitive loads.

**Simplify Semiconductor Component Test, Verification, and Analysis**

The optional ACS Basic Edition software maximizes the productivity of customers who perform packaged part characterization during development, quality verification, or failure analysis. Key features include:

- Rich set of easy-to-access test libraries
- Script editor for fast customization of existing tests
- Data tool for comparing results quickly
- Formulator tool that analyzes captured curves and provides a wide range of math functions

For more information about the ACS Basic Edition software, please refer to the ACS Basic Edition data sheet.

**Powerful Software Tools**

In addition to the embedded Java-based plug & play software and optional ACS Basic Edition software, the free Test Script Builder software tool is provided to help users create, modify, debug, and store TSP test scripts. Table 1 describes key features of Series 2600B software tools.

**Three new dual-channel bench-top models of Series 2600B offer industry-best value and performance.**

For applications that do not require leading-edge system-level automation capabilities, Keithley has expanded the 2600B series to include 3 new value-priced “bench-top” models – the 2604B, 2614B, and 2634B. These models offer similar performance to Models 2602B, 2612B, and 2636B, respectively, however do not include TSP-Link, Contact Check, and Digital I/O capabilities.

**Complete Automated System Solutions**

Keithley’s S500 Integrated Test Systems are highly configurable, instrument-based systems for semiconductor characterization at the device, wafer, or cassette level. Built on our proven Series 2600 System SourceMeter SMU instruments, our S500 Integrated Test Systems provide innovative measurement features and system flexibility, scalable to your needs. The unique measurement capability, combined with the powerful and flexible Automated Characterization Suite (ACS) software, provides a comprehensive range of applications and features not offered on other comparable systems on the market.

When you need to acquire data on a packaged part quickly, the wizard-based user interface of ACS Basic Edition makes it easy to find and run the test you want, like this common FET curve trace test.

The flexible software architecture of ACS Basic Edition allows configuring systems with a wide range of controllers and test fixtures, as well as the exact number of SourceMeter instruments the application requires.
TYPICAL APPLICATIONS

I-V functional test and characterization of a wide range of devices, including:

- Discrete and passive components
  - Two-leaded – Sensors, disk drive heads, metal oxide varistors (MOVs), diodes, zener diodes, sensors, capacitors, thermistors
  - Three-leaded – Small signal bipolar junction transistors (BJTs), field-effect transistors (FETs), and more
- Simple ICs – Optos, drivers, switches, sensors, converters, regulators
- Integrated devices – small scale integrated (SSI) and large scale integrated (LSI)
  - Analog ICs
  - Radio frequency integrated circuits (RFICs)
  - Application specific integrated circuits (ASICs)
  - System on a chip (SOC) devices
- Optoelectronic devices such as light-emitting diodes (LEDs), laser diodes, high brightness LEDs (HBLEDs), vertical cavity surface-emitting lasers (VCSELs), displays
- Wafer level reliability
  - NBTI, TDDB, HCI, electromigration
- Solar Cells
- Batteries
- And more...

In the first and third quadrants, Series 2600B instruments operate as a source, delivering power to a load. In the second and fourth quadrants, they operate as a sink, dissipating power internally.

Models 2601B, 2602B, and 2604B I-V capability

Models 2611B, 2612B, and 2614B I-V capability

Models 2634B, 2635B, and 2636B I-V capability
Series 2600B specifications

System SourceMeter® SMU
(Source-Measure Unit) Instruments

SPECIFICATION CONDITIONS

This document contains specifications and supplemental information for the Models 2601B, 2602B, and 2604B System SourceMeter® instruments. Specifications are the standards against which the Models 2601B, 2602B, and 2604B meet these specifications. Supplemental and typical values are non-warranted, apply at 23°C, and are provided solely as useful information.

Accuracy specifications are applicable for both normal and high capacitance modes. The source and measurement accuracies are specified at the SourceMeter CHANNEL A (2601B, 2602B, and 2604B) or SourceMeter CHANNEL B (2602B and 2604B) terminals under the following conditions:

1. 23°C ± 5°C; <70% relative humidity
2. After 2 hour warm-up
3. Speed normal (1 NPLC)
4. A/D auto-zero enabled
5. Remote sense operation or properly zeroed local operation
6. Calibration period = 1 year

SOURCE SPECIFICATIONS

VOLTAGE SOURCE SPECIFICATIONS

VOLTAGE PROGRAMMING ACCURACY:

<table>
<thead>
<tr>
<th>Range</th>
<th>Programming Resolution</th>
<th>Accuracy (1 Year) 23°C ±5°C (% rdg. ± volts)</th>
<th>Typical Noise (peak-peak) 0.1Hz–10Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>5 µV</td>
<td>0.02% ± 250 µV</td>
<td>±0.1% of range</td>
</tr>
<tr>
<td>1 V</td>
<td>50 µV</td>
<td>0.02% ± 400 µV</td>
<td>±0.1% of range</td>
</tr>
<tr>
<td>6 V</td>
<td>50 µV</td>
<td>0.02% ± 1.8 mV</td>
<td>±0.1% of range</td>
</tr>
<tr>
<td>40 V</td>
<td>500 µV</td>
<td>0.02% ± 12 mV</td>
<td>±0.1% of range</td>
</tr>
</tbody>
</table>

TEMPERATURE COEFFICIENT (0°–18°C and 28°–50°C): ±0.15 % accuracy specifications/°C. Applicable for normal mode only. Not applicable for high capacitance mode.

MAXIMUM OUTPUT POWER AND SOURCE/SINK LIMITS: ±40W per channel maximum.

VOLTAGE REGULATION: Line: <20mV peak-peak (typical), <3mV RMS (typical), 6V range.

GUARD OFFSET VOLTAGE: <±0.1% typical. Current <10mA.

CURRENT SOURCE SPECIFICATIONS

CURRENT PROGRAMMING ACCURACY:

<table>
<thead>
<tr>
<th>Range</th>
<th>Programming Resolution</th>
<th>Accuracy (1 Year) 23°C ±5°C (% rdg. + amps)</th>
<th>Typical Noise (peak-peak) 0.1Hz–10Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 nA</td>
<td>2 pA</td>
<td>0.06% + 100 pA</td>
<td>5 pA</td>
</tr>
<tr>
<td>1 µA</td>
<td>20 pA</td>
<td>0.03% + 800 pA</td>
<td>25 pA</td>
</tr>
<tr>
<td>10 µA</td>
<td>200 pA</td>
<td>0.05% + 5 nA</td>
<td>60 pA</td>
</tr>
<tr>
<td>100 µA</td>
<td>2 nA</td>
<td>0.03% + 60 nA</td>
<td>6 nA</td>
</tr>
<tr>
<td>1 mA</td>
<td>20 nA</td>
<td>0.03% + 300 nA</td>
<td>6 nA</td>
</tr>
<tr>
<td>10 mA</td>
<td>200 nA</td>
<td>0.05% + 6 µA</td>
<td>200 nA</td>
</tr>
<tr>
<td>100 mA</td>
<td>2 µA</td>
<td>0.03% + 30 µA</td>
<td>600 nA</td>
</tr>
<tr>
<td>1 A</td>
<td>20 µA</td>
<td>0.05% + 1.8 µA</td>
<td>70 µA</td>
</tr>
<tr>
<td>5 A</td>
<td>20 µA</td>
<td>0.06% + 4 mA</td>
<td>150 µA</td>
</tr>
<tr>
<td>10 A</td>
<td>200 µA</td>
<td>0.5% + 40 mA</td>
<td>400 µA</td>
</tr>
</tbody>
</table>

TEMPERATURE COEFFICIENT (0°–18°C and 28°–50°C): ±0.15% accuracy specifications/°C. Maximum output power and source/sink limits: ±40W per channel maximum.

MAXIMUM OUTPUT POWER AND SOURCE/SINK LIMITS: ±40W per channel maximum.

CURRENT REGULATION: Line: ±0.1% of range, ±0.6% of current limit range.

NOTES

1. Add 50µV to source accuracy specifications per volt of HI lead drop.
2. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
3. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
4. Sink mode operation (quadrants II and IV), add 0.06% of limit range to the corresponding current limit accuracy specifications. Specifications apply with sink mode operation enabled.
5. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
6. Overshoot into a 100k source lead.
7. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
8. Full power source operation regardless of load to 30°C ambient. Check with factory for additional test conditions.
9. Sink mode operation (quadrants II and IV), add 0.06% of limit range to the corresponding voltage source specification.
10. 5mA range accessible only in pulse mode.
11. 3A range accessible only in pulse mode.
12. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.

ADDITIONAL SOURCE SPECIFICATIONS

TRANSIENT RESPONSE TIME: <70µs for the output to recover to within 0.1% for a 10% to 90% step change in load.

VOLTAGE SOURCE OUTPUT SETTLING TIME: Time required to reach within 0.1% of final value after source level command is processed on a fixed range.

100mV, 4V Ranges: <5µs typical.
6V Range: <10µs typical.
40V Range: <50µs typical.

CURRENT SOURCE OUTPUT SETTLING TIME: Time required to reach within 0.1% of final value after source level command is processed on a fixed range. Values below for Iout × Rload = 4V unless noted.
3A Range: <20µs typical (current less than 2.5A, Rload >2Ω).
1A–10mA Ranges: <80µs typical (Rload >6Ω).
1mA Range: <1µs typical.
10µA Range: <5µs typical.
1µA Range: <25µs typical.

MAXIMUM OUTPUT POWER AND SOURCE/SINK LIMITS: 40.4W per channel maximum.

VOLTAGE OUTPUT HEADROOM: 40W: Maximum voltage between HI and SENSE HI = 3V.
6V: Maximum voltage between LO and SENSE LO = 3V.

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

VOLTAGE SOURCE RANGE CHANGE OVERSHOOT: <300mV + 0.1% of larger range (typical).

Overshoot into an 100Ω load, 20MHz BW.

CURRENT SOURCE RANGE CHANGE OVERSHOOT: <5% of larger range + 500mV/Rload (typical with source settling set to SETTLE_SMOOTH_100NA). See Current Source Output Settling Time for additional test conditions.

NOTES

1. Add 50µV to source accuracy specifications per volt of HI lead drop.
2. High Capacitance Mode accuracy is applicable at 25°C ±5°C only.
3. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
4. Sink mode operation (quadrants II and IV), add 0.06% of limit range to the corresponding current limit accuracy specifications. Specifications apply with sink mode operation enabled.
5. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
6. Overshoot into a 100k source lead.
7. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
8. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
9. Sink mode operation (quadrants II and IV), add 0.06% of limit range to the corresponding voltage source specification.
10. 5mA range accessible only in pulse mode.
11. 3A range accessible only in pulse mode.
12. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
13. Full power source operation regardless of load to 30°C ambient. Check with factory for additional test conditions.
14. 5mA range accessible only in pulse mode.
15. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
16. Full power source operation regardless of load to 30°C ambient. Check with factory for additional test conditions.
17. Sink mode operation (quadrants II and IV), add 0.06% of limit range to the corresponding voltage source specification.

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A Greater Measure of Confidence
Series 2600B specifications

PULSE SPECIFICATIONS (continued)

<table>
<thead>
<tr>
<th>Region</th>
<th>Maximum Current Limit</th>
<th>Maximum Pulse Width</th>
<th>Maximum Duty Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 A @ 40 V</td>
<td>DC, no limit</td>
<td>100%</td>
</tr>
<tr>
<td>1</td>
<td>3 A @ 6 V</td>
<td>DC, no limit</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>1.5 A @ 40 V</td>
<td>100 ms</td>
<td>25%</td>
</tr>
<tr>
<td>3</td>
<td>5 A @ 35 V</td>
<td>4 ms</td>
<td>4%</td>
</tr>
<tr>
<td>4</td>
<td>10 A @ 20 V</td>
<td>1.8 ms</td>
<td>1%</td>
</tr>
</tbody>
</table>

MINIMUM PROGRAMMABLE PULSE WIDTH 14, 15: 100µs. NOTE: Minimum pulse width for settled source at a given I/V output and load can be longer than 100µs.

PULSE WIDTH PROGRAMMING RESOLUTION: 1µs.

PULSE WIDTH PROGRAMMING ACCURACY 15: ±5µs.

PULSE WIDTH JITTER: 2µs (typical).

NOTES
12. Times measured from the start of pulse to the start off-time; see figure below.

13. Thermally limited in sink mode (quadrants II and IV) and ambient temperatures above 30°C. See power equations in the reference manual for more information.

14. Typical performance for minimum settled pulse widths:

<table>
<thead>
<tr>
<th>Source Value</th>
<th>Load</th>
<th>Source Setting (% of range)</th>
<th>Min. Pulse Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 V</td>
<td>2 Ω</td>
<td>1%</td>
<td>350 µs</td>
</tr>
<tr>
<td>20 V</td>
<td>2 Ω</td>
<td>0%</td>
<td>200 µs</td>
</tr>
<tr>
<td>35 V</td>
<td>7 Ω</td>
<td>0.5%</td>
<td>500 µs</td>
</tr>
<tr>
<td>40 V</td>
<td>27 Ω</td>
<td>0.1%</td>
<td>400 µs</td>
</tr>
<tr>
<td>1.5 A</td>
<td>27 Ω</td>
<td>0.1%</td>
<td>15 ms</td>
</tr>
<tr>
<td>5 A</td>
<td>7 Ω</td>
<td>0.5%</td>
<td>500 µs</td>
</tr>
<tr>
<td>10 A</td>
<td>2 Ω</td>
<td>0.5%</td>
<td>200 µs</td>
</tr>
</tbody>
</table>

15. Times measured from the start of pulse to the start off-time; see figure below.

16. Add 90µV to source accuracy specifications per volt of HI lead drop.

17. De-rate accuracy specifications for NPLC setting < 1 by increasing error term.

ADDITIONAL METER SPECIFICATIONS

METER SPECIFICATIONS

VOLTAGE MEASUREMENT ACCURACY 16, 17:

<table>
<thead>
<tr>
<th>Range</th>
<th>Default Display Resolution</th>
<th>Input Resistance</th>
<th>Accuracy (1 Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>100 mV</td>
<td>&gt;10 GΩ</td>
<td>±(% rdg. + volts)</td>
</tr>
<tr>
<td>1 V</td>
<td>1 µV</td>
<td>&gt;10 GΩ</td>
<td>0.015% + 200 µV</td>
</tr>
<tr>
<td>6 V</td>
<td>10 µV</td>
<td>&gt;10 GΩ</td>
<td>0.015% + 1 mV</td>
</tr>
<tr>
<td>40 V</td>
<td>100 µV</td>
<td>&gt;10 GΩ</td>
<td>0.05% + 8 µV</td>
</tr>
</tbody>
</table>

CURRENT MEASUREMENT ACCURACY 17:

<table>
<thead>
<tr>
<th>Range</th>
<th>Default Display Resolution</th>
<th>Voltage Burden</th>
<th>Accuracy (1 Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 nA</td>
<td>100 µA</td>
<td>&lt;1 mV</td>
<td>±(% rdg. + amps)</td>
</tr>
<tr>
<td>1 µA</td>
<td>10 µA</td>
<td>&lt;1 mV</td>
<td>0.02% + 200 µA</td>
</tr>
<tr>
<td>10 µA</td>
<td>100 µA</td>
<td>&lt;1 mV</td>
<td>0.02% + 2.5 µA</td>
</tr>
<tr>
<td>100 µA</td>
<td>1000 µA</td>
<td>&lt;1 mV</td>
<td>0.02% + 20 µA</td>
</tr>
<tr>
<td>1 A</td>
<td>10 A</td>
<td>&lt;1 mV</td>
<td>0.05% + 15 mA</td>
</tr>
<tr>
<td>3 A</td>
<td>10 A</td>
<td>&lt;1 mV</td>
<td>0.05% + 35 mA</td>
</tr>
<tr>
<td>10 A</td>
<td>100 A</td>
<td>&lt;1 mV</td>
<td>0.4% + 25 mA (typical)</td>
</tr>
</tbody>
</table>

CURRENT MEASURE SETTLING TIME (Time for measurement to settle after a V step):

Applicable for normal mode only. Not applicable for high capacitance mode.

CONTACT CHECK 25 (not available on Model 2604B)

ADDITIONAL METER SPECIFICATIONS

MATERIAL LOAD IMPEDANCE:

Normal Mode: 10mF (typical). High Capacitance Mode: 50µF (typical).

COMMON MODE ISOLATION: >10GΩ, <4500pF.

OVERRANGE: 101% of source range, 102% of measure range.

MAXIMUM SENSE LEAD RESISTANCE: 1kΩ for rated accuracy.

METER SPECIFICATIONS

SENSE INPUT IMPEDANCE: >10GΩ.

NOTES
18. Applies when in single channel display mode.

19. High Capacitance Mode accuracy is applicable for 25°C ±5°C only.

20. Applies when in single channel display mode.

21. Four-wire remote sense only with current meter mode selected. Voltage measurement set to 100mV or 1V range only.

22. 10A range accessible only in pulse mode.

23. Compliance equal to 100mA.

24. High Capacitance Mode accuracy is applicable for 25°C ±5°C only.

25. Includes measurement of SENSE HI to HI and SENSE LO to LO contact resistances.
### 2601B, 2602B, 2604B

**System SourceMeter® SMU (Source-Measure Unit) Instruments**

**HIGH CAPACITANCE MODE** 26, 27, 28

**VOLTAGE SOURCE OUTPUT SETTLING TIME:** Time required to reach 0.1% of final value after source level command is processed on a fixed range. Current limit = 1 A.

<table>
<thead>
<tr>
<th>Voltage Source Range</th>
<th>Settling Time with $C_{load} = 4.7\mu F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>200 µs (typical)</td>
</tr>
<tr>
<td>1 V</td>
<td>200 µs (typical)</td>
</tr>
<tr>
<td>6 V</td>
<td>200 µs (typical)</td>
</tr>
<tr>
<td>40 V</td>
<td>7 ms (typical)</td>
</tr>
</tbody>
</table>

**CURRENT MEASURE SETTLING TIME:** Time required to reach 0.1% of final value after voltage source is stabilized on a fixed range. Values below for $V_{out} = 1V$ unless noted.

<table>
<thead>
<tr>
<th>Current Measure Range</th>
<th>Settling Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 A – 1 A</td>
<td>&lt;120 µs (typical) ($R_{load} &gt; 2\Omega$)</td>
</tr>
<tr>
<td>100 mA – 10 mA</td>
<td>&lt;100 µs (typical)</td>
</tr>
<tr>
<td>1 mA</td>
<td>&lt; 5 ms (typical)</td>
</tr>
<tr>
<td>100 µA</td>
<td>&lt; 3 ms (typical)</td>
</tr>
<tr>
<td>10 µA</td>
<td>&lt; 230 ms (typical)</td>
</tr>
</tbody>
</table>

**CAPACITOR LEAKAGE PERFORMANCE USING HIGH-C SCRIPTS:**

Test: 5V step and measure. 200ms (typical) @ 50nA.

- **1µA and 10µA Current Ranges:**
  - 10 µA: < 200 µs (typical)
  - 100 µA – 10 mA: <100 µs (typical)

**MODE CHANGE DELAY:**

- 100µA Current Range and Above:
  - Delay into High Capacitance Mode: 10ms.
  - Delay out of High Capacitance Mode: 10ms.
- 1µA and 10µA Current Ranges:
  - Delay into High Capacitance Mode: 250ms.
  - Delay out of High Capacitance Mode: 10ms.

**VOLTAGE SOURCE RANGE CHANGE OVERSHOOT:**

- <400mV + 0.1% of larger range (typical).
- Overshoot into a 100kΩ load, 20MHz BW.

**NOTES**

- 26. High Capacitance Mode specifications are for DC measurements only.
- 27. 100A range is not available in High Capacitance Mode.

---

**GENERAL**


**USB CONTROL (REAR):** USB 2.0 device, TMC488 protocol.

**RS-232:** Baud rates from 300bps to 115200bps.

**ETHERNET:** RJ-45 connector, LXI Class C, 10/100BT, no auto MDIX.

**EXPANSION INTERFACE:** The TSP-Link expansion interface allows TSP enabled instruments to trigger and communicate with each other. (Not available on Model 2604B.)

**Cable Type:** Category 5e or higher LAN crossover cable.

**Digital I/O Pin:**

- **5V Pin**
- **GND Pin**

**Connector:** 25-pin female D.

**Input/Output Pins:** 14 open drain I/O bits.

**Absolute Maximum Input Voltage:** 5.25V.

**Absolute Minimum Input Voltage:** -0.25V.

**Maximum Logic Low Input Voltage:** 0.7V, +950µA max.

**Minimum Logic High Input Voltage:** 2.1V, +570µA.

**Maximum Source Current (flowing out of Digital I/O bit):** +960µA

**Maximum Sink Current (flowing into Digital I/O pin):** –11mA (not including firmware)

**USB FILE SYSTEM (FRONT):** USB 2.0 Host: Mass storage class device.

**POWER SUPPLY:** 100V to 250VAC. 50–60Hz (auto sensing). 240VAC max.

**COOLING:** Forced air. Side intake and rear exhaust. One side must be unobstructed when rack mounted.

**EMC:** Conforms to European Union Directive 2004/108/EC, EN 61326-1.

**SAFETY:** Conforms to European Union Directive 73/23/EEC, EN 61010-1, and UL 61010-1.

**DIMENSIONS:**

- 89mm high × 213mm wide × 460mm deep (3½ in × 8½ in × 18 in).
- 89mm high × 238mm wide × 460mm deep (3½ in × 9 in × 18 in).

**WEIGHT:**

- 2601B: 4.75kg (10.4 lbs).
- 2602B: 5.50kg (12.0 lbs).
- 2604B: 9.1kg (20.0 lbs).

**ENVIRONMENT:**

- **Altitude:** Maximum 2000 meters above sea level.
- **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.

---

**SEE PAGES 14 AND 15 FOR MEASUREMENT SPEEDS AND OTHER SPECIFICATIONS.**

1.888.KEITHLEY (U.S. only)

www.keithley.com
**SPECIFICATION CONDITIONS**

This document contains specifications and supplemental information for the Models 2611B, 2612B, and 2614B System SourceMeter® instruments. Specifications are the standards against which the Models 2611B, 2612B, and 2614B are tested. Upon leaving the factory the 2611B, 2612B, and 2614B meet these specifications. Supplemental and typical values are non-warranted, apply at 23°C, and are provided solely as useful information.

Accuracy specifications are applicable for both normal and high capacitance modes.

The source and measurement accuracies are specified at the SourceMeter CHANNEL A (2611B, 2612B, and 2614B) or SourceMeter CHANNEL B (2612B, 2614B) terminals under the following conditions:

1. 23°C ± 5°C, <70% relative humidity.
2. After 2 hour warm-up.
3. Speed normal (1 NPLC).
5. Remote sense operation or properly zeroed local sense operation.
6. Calibration period = 1 year.

**SOURCE SPECIFICATIONS**

**VOLTAGE SOURCE SPECIFICATIONS**

**VOLTAGE PROGRAMMING ACCURACY**

<table>
<thead>
<tr>
<th>Range</th>
<th>Programming Resolution</th>
<th>Accuracy (1 Year)</th>
<th>Typical Noise (Peak-Peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>±(% rdg. + volts)</td>
<td>0.1Hz–10Hz</td>
</tr>
<tr>
<td>200 mV</td>
<td>5 µV</td>
<td>0.02% ± 375 µV</td>
<td>20 µV</td>
</tr>
<tr>
<td>2</td>
<td>50 µV</td>
<td>0.02% ± 600 µV</td>
<td>50 µV</td>
</tr>
<tr>
<td>20</td>
<td>500 µV</td>
<td>0.02% ± 5 mV</td>
<td>300 µV</td>
</tr>
<tr>
<td>200</td>
<td>5 mV</td>
<td>0.02% ± 50 mV</td>
<td>2 mV</td>
</tr>
</tbody>
</table>

**TEMPERATURE COEFFICIENT (0°–18°C and 28°–50°C)**

<table>
<thead>
<tr>
<th>Range</th>
<th>TEMPERATURE COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(±0.15 × accuracy specification) °C</td>
</tr>
<tr>
<td>200 mV</td>
<td>±20.2V (±15A, ±202V @ 100mA, four quadrant source or sink operation)</td>
</tr>
<tr>
<td>2</td>
<td>±20V (±1A, ±20V @ 100mA)</td>
</tr>
</tbody>
</table>

**CURRENT LIMIT/COMPLIANCE**

<table>
<thead>
<tr>
<th>Range</th>
<th>CURRENT LIMIT/COMPLIANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Source-Measure Unit) Instruments</td>
</tr>
</tbody>
</table>

**MAXIMUM OUTPUT POWER AND SOURCE/SINK LIMITS**

<table>
<thead>
<tr>
<th>Range</th>
<th>MAXIMUM OUTPUT POWER AND SOURCE/SINK LIMITS (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>0.01% of range (±10% to 90% of range)</td>
</tr>
<tr>
<td>2</td>
<td>±100% (±50%)</td>
</tr>
<tr>
<td>20</td>
<td>±600% (±300%)</td>
</tr>
<tr>
<td>200</td>
<td>±2500% (±1250%)</td>
</tr>
</tbody>
</table>

**DOUBLED WAVEFORM**

<table>
<thead>
<tr>
<th>Range</th>
<th>DOUBLED WAVEFORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mA</td>
<td>200 mV &lt;50 µs (typical)</td>
</tr>
<tr>
<td>1 mA</td>
<td>200 mV &lt;50 µs (typical)</td>
</tr>
<tr>
<td>10 mA</td>
<td>200 mV &lt;100 µs (typical)</td>
</tr>
<tr>
<td>100 mA</td>
<td>200 mV &lt;200 µs (typical)</td>
</tr>
<tr>
<td>1 A</td>
<td>200 mV &lt;500 µs (typical)</td>
</tr>
</tbody>
</table>

**CURRENT SOURCE SPECIFICATIONS**

**CURRENT PROGRAMMING ACCURACY**

<table>
<thead>
<tr>
<th>Range</th>
<th>CURRENT PROGRAMMING ACCURACY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Source-Measure Unit) Instruments</td>
</tr>
</tbody>
</table>

**ADDITIONAL SOURCE SPECIFICATIONS**

**TRANSIENT RESPONSE TIME**

<table>
<thead>
<tr>
<th>Range</th>
<th>TRANSIENT RESPONSE TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>&lt;70 µs for the output to recover to within 0.1% for a 10% to 90% step change in load</td>
</tr>
<tr>
<td>2</td>
<td>&lt;70 µs (typical)</td>
</tr>
<tr>
<td>20</td>
<td>&lt;110 µs (typical)</td>
</tr>
<tr>
<td>200</td>
<td>&lt;300 µs (typical)</td>
</tr>
</tbody>
</table>

**VOLTAGE SOURCE OUTPUT SETTLING TIME**

<table>
<thead>
<tr>
<th>Range</th>
<th>VOLTAGE SOURCE OUTPUT SETTLING TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>Time required to reach within 0.1% of final value after source level command is processed on a fixed range. Values below for Iout · Rload = 2V unless noted.</td>
</tr>
<tr>
<td>2</td>
<td>Current Range Settling Time</td>
</tr>
<tr>
<td>20</td>
<td>Voltage Range Settling Time</td>
</tr>
</tbody>
</table>

**OVERSHOOT**

<table>
<thead>
<tr>
<th>Range</th>
<th>OVERSHOOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mA</td>
<td>&lt;500 mV &lt;700 µs (typical)</td>
</tr>
<tr>
<td>1 mA</td>
<td>&lt;100 mV &lt;110 µs (typical)</td>
</tr>
<tr>
<td>10 mA</td>
<td>&lt;200 mV &lt;200 µs (typical)</td>
</tr>
<tr>
<td>100 mA</td>
<td>&lt;1000 mV &lt;1100 µs (typical)</td>
</tr>
<tr>
<td>1 A</td>
<td>&lt;5000 mV &lt;5000 µs (typical)</td>
</tr>
</tbody>
</table>

**NOTES**

1. Add 50 µV to source accuracy specifications per volt of HI lead drop.
2. High Capacitance Mode accuracy is applicable at 23°C ± 5°C only.
3. Full power source operation regardless of load to 50°C ambient. Above 50°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
4. For sink mode operation (quadrants II and IV), add 0.06% of limit range to the corresponding current limit specifications. Specifications apply with sink mode operation enabled.
5. Accuracy specifications do not include connector leakage. Derate accuracy by (Vout/2E11) per °C when operating <18°C and >28°C.
6. Full power source operation regardless of load to 50°C ambient. Above 50°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
7. 10A range accessible only in pulse mode.
8. High Capacitance Mode accuracy is applicable at 23°C ± 5°C only.
9. Full power source operation regardless of load to 50°C ambient. Above 50°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
10. For sink mode operation (quadrants II and IV), add 10% of compliance range and ±0.02% of limit setting to corresponding voltage source specification. For 200mV range add an additional 1200V of uncertainty.
11. Add 50 µV to source accuracy specifications per volt of HI lead drop.

**PULSE SPECIFICATIONS**

**MINIMUM PROGRAMMABLE PULSE WIDTH**

<table>
<thead>
<tr>
<th>Region</th>
<th>Minimum Current Limit</th>
<th>Maximum Pulse Width</th>
<th>Maximum Duty Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100 mA @ 200 V</td>
<td>DC, no limit</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>1.5 A @ 20 V</td>
<td>DC, no limit</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>1 A @ 100 V</td>
<td>8.5 ms</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>10 A @ 5 V</td>
<td>2.2 ms</td>
<td>1%</td>
</tr>
</tbody>
</table>

**PULSE WIDTH PROGRAMMING RESOLUTION**

1 µs

**PULSE WIDTH PROGRAMMING ACCURACY**

±5%
SOURCE SPECIFICATIONS (continued)

PULSE SPECIFICATIONS (continued)

QUADRANT DIAGRAM:

+1A
+1.5A
+0.1A
0A
-0.1A
-1A
-1.5A

-200V  -180V  -160V  -140V  -120V  -100V  -80V  -60V  -40V  -20V  0V  +20V  +40V  +60V  +80V  +100V  +120V  +140V  +160V  +180V  +200V

NOTES

12. Times measured from the start of pulse to the start off-time; see figure below.

13. Thermally limited in sink mode (quadrants II and IV) and ambient temperatures above 30°C.

14. Voltage source operation with 1.5 A current limit.

15. Typical performance for minimum settled pulse widths:

<table>
<thead>
<tr>
<th>Source Value</th>
<th>Load (Ω)</th>
<th>Source Settling (% of range)</th>
<th>Min. Pulse Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 V</td>
<td>0.5</td>
<td>1%</td>
<td>500 µs</td>
</tr>
<tr>
<td>20 V</td>
<td>20</td>
<td>0.2%</td>
<td>200 µs</td>
</tr>
<tr>
<td>100 V</td>
<td>100</td>
<td>0.2%</td>
<td>5 ms</td>
</tr>
<tr>
<td>200 V (1.5 A Limit)</td>
<td>200</td>
<td>0.2%</td>
<td>1.5 ms</td>
</tr>
<tr>
<td>100 mA</td>
<td>200</td>
<td>1%</td>
<td>200 µs</td>
</tr>
<tr>
<td>1 A</td>
<td>200</td>
<td>1%</td>
<td>500 µs</td>
</tr>
<tr>
<td>1 A</td>
<td>1800</td>
<td>0.2%</td>
<td>5 ms</td>
</tr>
<tr>
<td>10 A</td>
<td>0.5</td>
<td>0.5%</td>
<td>500 µs</td>
</tr>
</tbody>
</table>

Typical tests were performed using remote operation, IΩ sense, and best, fixed measurement range. For more information on pulse scripts, see the Series 2600B Reference Manual.

16. Times measured from the start of pulse to the start off-time; see figure below.

METER SPECIFICATIONS

VOLTAGE MEASUREMENT ACCURACY 17, 18

<table>
<thead>
<tr>
<th>Range</th>
<th>Default Display Resolution 19</th>
<th>Input Resistance 20</th>
<th>Accuracy (1 Year) 23°C ±5°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>100 nV</td>
<td>&gt;10 GΩ</td>
<td>0.015% + 225 µV</td>
</tr>
<tr>
<td>2 V</td>
<td>1 µV</td>
<td>&gt;10 GΩ</td>
<td>0.02% + 350 µV</td>
</tr>
<tr>
<td>20 V</td>
<td>10 µV</td>
<td>&gt;10 GΩ</td>
<td>0.015% + 5 mV</td>
</tr>
<tr>
<td>200 V</td>
<td>100 µV</td>
<td>&gt;10 GΩ</td>
<td>0.015% + 50 mV</td>
</tr>
</tbody>
</table>

TEMPERATURE COEFFICIENT (0°–18°C and 28°–50°C) 20: ±(0.15 × accuracy specification)/°C.

Applicable for normal mode only. Not applicable for high capacitance mode.

CURRENT MEASUREMENT ACCURACY 18, 21

<table>
<thead>
<tr>
<th>Range</th>
<th>Default Display Resolution 22</th>
<th>Voltage Burden 23</th>
<th>Accuracy (1 Year) 23°C ±5°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 nA</td>
<td>100 A</td>
<td>&lt;1 mV</td>
<td>0.06% + 100 pA</td>
</tr>
<tr>
<td>1 µA</td>
<td>1 pA</td>
<td>&lt;1 mV</td>
<td>0.025% + 500 pA</td>
</tr>
<tr>
<td>10 µA</td>
<td>10 pA</td>
<td>&lt;1 mV</td>
<td>0.025% + 1.5 nA</td>
</tr>
<tr>
<td>100 µA</td>
<td>100 pA</td>
<td>&lt;1 mV</td>
<td>0.02% + 25 nA</td>
</tr>
<tr>
<td>1 mA</td>
<td>1 nA</td>
<td>&lt;1 mV</td>
<td>0.02% + 200 nA</td>
</tr>
<tr>
<td>10 mA</td>
<td>10 nA</td>
<td>&lt;1 mV</td>
<td>0.02% + 2.5 µA</td>
</tr>
<tr>
<td>100 mA</td>
<td>100 nA</td>
<td>&lt;1 mV</td>
<td>0.02% + 20 µA</td>
</tr>
<tr>
<td>1 A</td>
<td>1 µA</td>
<td>&lt;1 mV</td>
<td>0.01% + 1.5 mA</td>
</tr>
<tr>
<td>1.5 A</td>
<td>1 µA</td>
<td>&lt;1 mV</td>
<td>0.05% + 3.5 mA</td>
</tr>
<tr>
<td>10 A</td>
<td>10 µA</td>
<td>&lt;1 mV</td>
<td>0.4% + 25 mA (typical)</td>
</tr>
</tbody>
</table>

CURRENT MEASURE SETTLING TIME (Time for measurement to settle after a Vstep): 5; Time required to reach 0.1% of final value after source level command is processed on a fixed range.

Values for V_mean = 2V unless noted. Current Range: 1mA. Settling Time: <100 µs (typical).

TEMPERATURE COEFFICIENT (0°–18°C and 28°–50°C) 20: ±(0.15 × accuracy specification)/°C.

Applicable for normal mode only. Not applicable for high capacitance mode.

CONTACT CHECK 27 (not available on Model 2614B)

<table>
<thead>
<tr>
<th>Speed</th>
<th>Maximum Measurement Time to Memory For 60Hz (50Hz)</th>
<th>Accuracy (1 Year) 23°C ±5°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST</td>
<td>1 (1.2) ms</td>
<td>5% + 10 Ω</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>4 (5) ms</td>
<td>5% + 1.4 Ω</td>
</tr>
<tr>
<td>SLOW</td>
<td>56 (42) ms</td>
<td>5% + 0.5 Ω</td>
</tr>
</tbody>
</table>

ADDITIONAL METER SPECIFICATIONS

MAXIMUM LOAD IMPEDANCE:
Normal Mode: 10mΩ (typical). High Capacitance Mode: 50µΩ (typical).

COMMON MODE VOLTAGE: 250VDC.

COMMON MODE ISOLATION: >1GΩ, <500pF.

OVERRANGE: 101% of source range, 102% of measure range.

MAXIMUM SOURCE LEAD RESISTANCE: 1Ω for rated accuracy.

SENSE INPUT IMPEDANCE: >10GΩ.
## METER SPECIFICATIONS (continued)

<table>
<thead>
<tr>
<th>NPLC Setting</th>
<th>200mV Range</th>
<th>2V–200V Ranges</th>
<th>100mA Ranges</th>
<th>1µA–100mA Ranges</th>
<th>1A–1.5A Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.05%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
</tr>
<tr>
<td>0.05</td>
<td>0.08%</td>
<td>0.07%</td>
<td>0.1%</td>
<td>0.05%</td>
<td>0.05%</td>
</tr>
</tbody>
</table>

1. Applies when in single channel display mode.
2. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
3. Compliance equal to 100mA.
4. 10A range accessible only in pulse mode.
5. Includes measurement of SENSE HI to HI and SENSE LO to LO contact resistances.
6. 100µA < 3 ms (typical)
7. 1 µA < 230 ms (typical)
8. 200 mV 600 µs (typical)
9. Applies when in single channel display mode.
10. Four-wire remote sense only and with current meter mode selected. Voltage measure set to 200mV or
11. 27. Includes measurement of SENSE HI to HI and SENSE LO to LO contact resistances.
13. 100µA Current Range and Above:
14. Delay between 18°–28°C. Derate accuracy by V out/2E11 per °C when operating <18° and >28°C.
15. Accuracy specifications do not include connector leakage. De-rate accuracy by V out/2E11 + (0.15 * V out/2E11) per °C when operating <18°.
16. Applies when in single channel display mode.
17. Accuracy specifications for NPLC setting ≤1 by increasing error term. Add appropriate % of range term
18. Voltage source is stabilized on a fixed range. Values below for V out = 2V unless noted.
19. De-rate accuracy specifications for NPLC setting <1 by increasing error term. Add appropriate % of range term
20. In parallel with 3300pF.
21. De-rate accuracy specifications for NPLC setting <1 by increasing error term. Add appropriate % of range term
22. Delay out of High Capacitance Mode: 10ms.
23. Delay into High Capacitance Mode: 230ms.
24. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
25. Applies when in single channel display mode.
26. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
27. Includes measurement of SENSE HI to HI and SENSE LO to LO contact resistances.
28. Includes measurement of SENSE HI to HI and SENSE LO to LO contact resistances.
29. 100nA range is not available in High Capacitance Mode.
30. High Capacitance Mode specifications are for DC measurements only.
31. Accuracy specifications do not include connector leakage. De-rate accuracy by V out/2E11 + (0.15 * V out/2E11) per °C when operating <18°. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
32. Delay out of High Capacitance Mode: 10ms.
33. Delay into High Capacitance Mode: 230ms.
34. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
35. Applies when in single channel display mode.
36. De-rate accuracy specifications for NPLC setting <1 by increasing error term. Add appropriate % of range term

## SERIES 2600B SPECIFICATIONS

### VOLTAGE SOURCE OUTPUT SETTLING TIME:

Time required to reach within 0.1% of final value after source level command is processed on a fixed range. Current limit = 1A.

<table>
<thead>
<tr>
<th>Voltage Source Range</th>
<th>Settling Time with Cref = 4.7µF</th>
<th>50%</th>
<th>100%</th>
<th>500%</th>
<th>1000%</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>600 µs</td>
<td>1.5A</td>
<td>1A</td>
<td>0.5A</td>
<td>0.25A</td>
</tr>
<tr>
<td>2V</td>
<td>600 µs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20V</td>
<td>15 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 V</td>
<td>20 ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CURRENT MEASURE SETTLING TIME:

Time required to reach within 0.1% of final value after voltage source is stabilized on a fixed range. Values below for V out = 2V unless noted.

<table>
<thead>
<tr>
<th>Current Measure Range</th>
<th>Settling Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 A – 1 A</td>
<td>&lt;120 µs (typical)</td>
</tr>
<tr>
<td>100 mA – 10 mA</td>
<td>&lt;100 µs (typical)</td>
</tr>
<tr>
<td>1 mA</td>
<td>&lt;3 ms (typical)</td>
</tr>
<tr>
<td>100 µA</td>
<td>&lt;3 ms (typical)</td>
</tr>
<tr>
<td>10 µA</td>
<td>&lt;250 ms (typical)</td>
</tr>
<tr>
<td>1 µA</td>
<td>&lt;250 ms (typical)</td>
</tr>
</tbody>
</table>

### CAPACITOR LEAKAGE PERFORMANCE USING HIGH-C SCRIPTS:

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Load</th>
<th>Interlock Pin</th>
<th>GND Pin</th>
<th>+5V Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1kΩ</td>
<td>100µA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MODE CHANGE DELAY:

<table>
<thead>
<tr>
<th>100µA Current Range and Above:</th>
<th>Delay into High Capacitance Mode: 10ms.</th>
<th>Delay out of High Capacitance Mode: 10ms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A and 10µA Current Ranges:</td>
<td>Delay into High Capacitance Mode: 250ms.</td>
<td>Delay out of High Capacitance Mode: 10ms.</td>
</tr>
</tbody>
</table>

### VOLT METER INPUT IMPEDANCE:

50Ω in parallel with 3300pF.

### NOISE, 10Hz–20MHz (20V Range and below):

<30mV peak-peak (typical).

### VOLTAGE SOURCE RANGES:

2000mV to 200V 600µs (typical)

### NOTES

28. High Capacitance Mode specifications are for DC measurements only.
29. 300mA range is not available in High Capacitance Mode.
30. High Capacitance Mode utilizes locked ranges. Auto Range is disabled.

### 2614B

<table>
<thead>
<tr>
<th>Current</th>
<th>Load</th>
<th>Absolute Minimum Input Voltage</th>
<th>Absolute Minimum Input Voltage</th>
<th>Maximum Logic Low Input Voltage</th>
<th>Maximum Logic High Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A–1.5A</td>
<td>2.1V</td>
<td>–5.0mA.</td>
<td>+2.1V</td>
<td>0.7V.</td>
<td>2.1V</td>
</tr>
<tr>
<td>1A</td>
<td>2.1V</td>
<td>–5.0mA.</td>
<td>+2.1V</td>
<td>0.7V.</td>
<td>2.1V</td>
</tr>
</tbody>
</table>

### USB FILE SYSTEM (FRONT): USB 2.0 Host: Mass storage class device.

### POWER SUPPLY:

100V to 250VAC, 50–60Hz (auto sensing). 240VAC max.

### COOLING:

Forced air. Side intake and rear exhaust. One side must be unobstructed when rack mounted.

### EMC:


### SAFETY:


### DIMENSIONS:

98mm high x 213mm wide x 460mm deep (3½ in x 8½ in x 18½ in). Bench Configuration (with handle and feet): 145mm high x 238mm wide x 460mm deep (5½ in x 9½ in x 18 in).

### WEIGHT:

2614B: 4.6kg (10 lbs). 2612B, 2614B: 5.50kg (12 lbs).

### ENVIRONMENT:

For indoor use only. Altitude: Maximum 2000 meters above sea level.

### Operating:

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

### Storage:

–25°C to 65°C.
2634B, 2635B, 2636B

System SourceMeter® SMU
(Source-Measure Unit) Instruments

SPECIFICATION CONDITIONS

This document contains specifications and supplemental information for the Models 2634B, 2635B, and 2636B System SourceMeter® instruments. Specifications are the standards against which the Models 2634B, 2635B, and 2636B are tested. Upon leaving the factory the 2634B, 2635B, and 2636B meet these specifications. Supplemental and typical values are non-warranted, apply at 23°C, and are provided solely as useful information.

Accuracy specifications are applicable for both normal and high capacitance modes. The source and measurement accuracies are specified at the SourceMeter CHANNEL A (2634B, 2635B, and 2636B) or SourceMeter CHANNEL B (2634B, 2636B) terminals under the following conditions:

1. 23°C ± 5°C, <70% relative humidity.
2. After 2 hour warm-up
3. Speed normal (1 NPLC)
4. A/D auto-zero enabled
5. Remote sense operation or properly zeroed local sense operation
6. Calibration period = 1 year

SOURCE SPECIFICATIONS

VOLTAGE SOURCE SPECIFICATIONS

VOLTAGE PROGRAMMING ACCURACY

<table>
<thead>
<tr>
<th>Range</th>
<th>Programming Resolution</th>
<th>Accuracy (1 Year) 23°C ±5°C ±(% rdg. + volts)</th>
<th>Typical Noise (peak-peak) 0.1Hz-10Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>5 µV</td>
<td>0.02% + 375 µV</td>
<td>20 µV</td>
</tr>
<tr>
<td>2 V</td>
<td>50 µV</td>
<td>0.02% + 600 µV</td>
<td>50 µV</td>
</tr>
<tr>
<td>20 V</td>
<td>500 µV</td>
<td>0.02% + 5 mV</td>
<td>500 µV</td>
</tr>
<tr>
<td>200 V</td>
<td>5 mV</td>
<td>0.02% + 50 mV</td>
<td>2 mV</td>
</tr>
</tbody>
</table>

TEMPERATURE COEFFICIENT (0°C–18°C and 28°C–50°C) ±0.15 %/°C accuracy specification/°C. Applicable for normal mode only. Not applicable for high capacitance mode.

MAXIMUM OUTPUT POWER AND SOURCE/SINK LIMITS 3: ±30.3W per channel maximum. ±20V @ ±5A, ±20V @ ±100mA, four quadrant source or sink operation.

VOLTAGE REGULATION: ±(0.1% + 10mV) typical (step size = 10% to 90% of range, resistive load, maximum current limit compliance).

CURRENT LIMIT/COMPLIANCE 4: Bipolar current limit (compliance) set with a single value.

MINIMUM VALUE: 20mA. Accuracy is the same as current source.

GUARD OFFSET VOLTAGE: ±5mV (current <10mA). DC FLOATING VOLTAGE: Output can be floated up to ±250VDC.

CURRENT SOURCE SPECIFICATIONS

CURRENT PROGRAMMING ACCURACY

<table>
<thead>
<tr>
<th>Range</th>
<th>Programming Resolution</th>
<th>Accuracy (1 Year) 23°C ±5°C ±(% rdg. + amps)</th>
<th>Typical Noise (peak-peak) 0.1Hz-10Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mA</td>
<td>20 µA</td>
<td>0.15% + 2 µA</td>
<td>800 µA</td>
</tr>
<tr>
<td>10 mA</td>
<td>200 µA</td>
<td>0.15% + 5 µA</td>
<td>2 µA</td>
</tr>
<tr>
<td>100 mA</td>
<td>2 µA</td>
<td>0.06% + 50 µA</td>
<td>50 µA</td>
</tr>
<tr>
<td>1 µA</td>
<td>200 pA</td>
<td>0.03% + 700 pA</td>
<td>25 pA</td>
</tr>
<tr>
<td>10 µA</td>
<td>200 pA</td>
<td>0.03% + 5 µA</td>
<td>60 pA</td>
</tr>
<tr>
<td>100 µA</td>
<td>200 pA</td>
<td>0.03% + 60 µA</td>
<td>3 µA</td>
</tr>
<tr>
<td>1 mA</td>
<td>200 pA</td>
<td>0.03% + 300 µA</td>
<td>6 µA</td>
</tr>
<tr>
<td>100 mA</td>
<td>2000 pA</td>
<td>0.03% + 6 µA</td>
<td>200 µA</td>
</tr>
<tr>
<td>1 A</td>
<td>2 µA</td>
<td>0.05% + 1.8 mA</td>
<td>70 µA</td>
</tr>
<tr>
<td>1.5 A</td>
<td>50 µA</td>
<td>0.06% + 4 mA</td>
<td>150 µA</td>
</tr>
<tr>
<td>10 A</td>
<td>200 µA</td>
<td>0.5% + 40 µA</td>
<td>200 µA</td>
</tr>
</tbody>
</table>

TEMPERATURE COEFFICIENT (0°C–18°C and 28°C–50°C) ±0.15% accuracy specification/°C. Applicable for normal mode only. Not applicable for high capacitance mode.

MAXIMUM OUTPUT POWER AND SOURCE/SINK LIMITS 3: ±30.3W per channel maximum. ±1515A @ ±200V, ±101mA @ ±200V, four quadrant source or sink operation.

CURRENT LIMIT/COMPLIANCE 4: Bipolar voltage limit (compliance) set with a single value.

MINIMUM VALUE: 20mA. Accuracy is the same as voltage source.

OVERSHOOT: <0.1% typical (step size = 10% to 90% of range, resistive load, maximum current limit/compliance; see Current Source Output Settling Time for additional test conditions).

ADDITIONAL SOURCE SPECIFICATIONS

TRANSIENT RESPONSE TIME: <70µs for the output to recover to within 0.1% for a 10% to 90% step change in load.

VOLTAGE SOURCE OUTPUT SETTLING TIME: Time required to reach within 0.1% of final value after source level command is processed on a fixed range.

Range   Setting Time
200 mV <50 µs (typical)
2 V   <50 µs (typical)
20 V  <10 µs (typical)
200 V <700 µs (typical)

CURRENT SOURCE OUTPUT SETTLING TIME: Time required to reach within 0.1% of final value after source level command is processed on a fixed range. Values below for Iout · Rload = 2V unless noted.

Current Range Setting Time
1.5 A – 1 A <120 µs (typical) (Rout > 6Ω)
100 mA – 10 mA <80 µs (typical)
1 mA   <100 µs (typical)
10 µA  <500 µs (typical)
1 µA   <2 ms (typical)
100 nA <20 ms (typical)
10 nA  <40 ms (typical)
1 nA   <150 ms (typical)

DC FLOATING VOLTAGE: Output can be floated up to ±250VDC.

REMOTE SENSE OPERATING RANGE: Maximum voltage between HI and SENSE HI = 3V. Maximum voltage between LO and SENSE LO = 3V.

VOLTAGE OUTPUT HEADROOM: 200V Range: Max. output voltage = 202.3V – total voltage drop across source leads (maximum Iout · Rload = 2V per source lead).
20V Range: Max. output voltage = 23V – total voltage drop across source leads (maximum Iout · Rload = 2V per source lead).

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

VOLTAGE SOURCE RANGE CHANGE OVERSHOOT: <300mV + 0.1% of larger range (typical).
Overshoot into a 200kΩ load, 20MHz BW.
CURRENT SOURCE RANGE CHANGE OVERSHOOT: <5% of larger range + 500mV/Rout (typical). With source settling set to SETTLE_SMOOTH_100NA. See Current Source Output Setting Time for additional test conditions.

PULSE SPECIFICATIONS

Region    Maximum Current Limit    Maximum Pulse Width 11    Maximum Duty Cycle 12
1        100 mA @ 200 V    DC, no limit    100%
1        1.5 A @ 20 V      DC, no limit    100%
2        1 A @ 180 V       8.5 ms        1%
4        1 A @ 200 V       2.2 ms        1%
4        10 A @ 5 V        1 ms          2.2%

MINIMUM PROGRAMMABLE PULSE WIDTH 14: 100µs. NOTE: Minimum pulse width for settled source at a given I out output and load can be longer than 100µs.

PULSE WIDTH PROGRAMMING RESOLUTION: 1µs.
PULSE WIDTH PROGRAMMING ACCURACY 15: ±5µs.
PULSE WIDTH JITTER: 50µs (typical).

QUADRANT DIAGRAM:
2634B, 2635B, 2636B

System SourceMeter® SMU
(Source-Measure Unit) Instruments

SOURCE SPECIFICATIONS (continued)

NOTES
1. Add 50µV to source accuracy specifications per volt of HI lead drop.
2. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
3. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
4. For sink mode operation (quadrants II and IV), add 0.06% of limit range to the corresponding current limit accuracy specifications. Specifications apply with sink mode operation enabled.
5. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
6. 10A range accessible only in pulse mode.
7. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
8. Full power source operation regardless of load to 30°C ambient. Above 30°C and/or power sink operation, refer to “Operating Boundaries” in the Series 2600B Reference Manual for additional power derating information.
9. For sink mode operation (quadrants II and IV), add 10% of compliance range and ±0.02% of limit setting to corresponding voltage source specification. For 200mV range add an additional 120mV of uncertainty.
10. Add 50µV to source accuracy specifications per volt of HI lead drop.
11. Times measured from the start of pulse to the start off-time; see figure below.
12. Thermally limited in sink mode (quadrants II and IV) and ambient temperatures above 30°C. See power equations in the Reference Manual for more information.
13. Voltage source operation with 1.5 A current limit.
14. Typical performance for minimum settled pulse widths:

<table>
<thead>
<tr>
<th>Source Value</th>
<th>Load</th>
<th>Source Settling (% of range)</th>
<th>Min. Pulse Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 V</td>
<td>0.12</td>
<td>1%</td>
<td>500 µs</td>
</tr>
<tr>
<td>20 V</td>
<td>200 Ω</td>
<td>0.2%</td>
<td>200 µs</td>
</tr>
<tr>
<td>180 V</td>
<td>180 Ω</td>
<td>0.2%</td>
<td>5 ms</td>
</tr>
<tr>
<td>200 V (1.5 A Limit)</td>
<td>200 Ω</td>
<td>0.2%</td>
<td>3.5 ms</td>
</tr>
<tr>
<td>100 mA</td>
<td>200 Ω</td>
<td>1%</td>
<td>200 µs</td>
</tr>
<tr>
<td>1 A</td>
<td>180 Ω</td>
<td>0.2%</td>
<td>5 ms</td>
</tr>
<tr>
<td>10 A</td>
<td>0.5 Ω</td>
<td>0.5%</td>
<td>300 µs</td>
</tr>
</tbody>
</table>

Typical tests were performed using remote operation, 4W sense, and best, fixed measurement range. For more information on pulse scripts, see the Series 2600B Reference Manual.
15. Times measured from the start of pulse to the start off-time; see figure below.

METER SPECIFICATIONS

VOLTAGE MEASUREMENT ACCURACY

<table>
<thead>
<tr>
<th>Range</th>
<th>Default Display Resolution</th>
<th>Input Resistance</th>
<th>Accuracy (1 Year) 23°C ±5°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>100 mV</td>
<td>&gt;10¹ Ω</td>
<td>±(0.01% + 225 µV)</td>
</tr>
<tr>
<td>2 V</td>
<td>1 µV</td>
<td>&gt;10¹ Ω</td>
<td>±(0.02% + 350 µV)</td>
</tr>
<tr>
<td>20 V</td>
<td>10 µV</td>
<td>&gt;10¹ Ω</td>
<td>±(0.05% + 5 mV)</td>
</tr>
<tr>
<td>200 V</td>
<td>100 µV</td>
<td>&gt;10¹ Ω</td>
<td>±(0.05% + 50 mV)</td>
</tr>
</tbody>
</table>

TEMPERATURE COEFFICIENT (0°–18°C and 28°–50°C):
Applicable for normal mode only. Not applicable for high capacitance mode.

CURRENT MEASUREMENT ACCURACY

<table>
<thead>
<tr>
<th>Range</th>
<th>Default Display Resolution</th>
<th>Voltage Burden</th>
<th>Accuracy (1 Year) 23°C ±5°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 pA</td>
<td>0.1 fA</td>
<td>&lt;1 nV</td>
<td>±(0.01% + 200 fA)</td>
</tr>
<tr>
<td>1 nA</td>
<td>1 fA</td>
<td>&lt;1 mV</td>
<td>±(0.03% + 25 nA)</td>
</tr>
<tr>
<td>1 mA</td>
<td>10 fA</td>
<td>&lt;1 mV</td>
<td>±(0.05% + 120 fA)</td>
</tr>
<tr>
<td>10 mA</td>
<td>100 fA</td>
<td>&lt;1 mV</td>
<td>±(0.07% + 120 nA)</td>
</tr>
<tr>
<td>100 mA</td>
<td>1000 fA</td>
<td>&lt;1 mV</td>
<td>±(0.09% + 120 µA)</td>
</tr>
<tr>
<td>1 A</td>
<td>10 µA</td>
<td>&lt;1 mV</td>
<td>±(0.10% + 120 µA)</td>
</tr>
<tr>
<td>1.5 A</td>
<td>10 µA</td>
<td>&lt;1 mV</td>
<td>±(0.15% + 120 µA)</td>
</tr>
<tr>
<td>10 A</td>
<td>100 µA</td>
<td>&lt;1 mV</td>
<td>±(0.20% + 120 µA)</td>
</tr>
</tbody>
</table>

CURRENT MEASURE SETTLING TIME (Time for measurement to settle after a Vstep):
Time required to reach within 0.1% of final value after source level command is processed on a fixed range. Values for V_{out} = 2V unless noted. Current Range: 1mA. Settling Time: <4500µs (typical).

TEMPERATURE COEFFICIENT (0°–18°C and 28°–50°C):
Applicable for normal mode only. Not applicable for high capacitance mode.

CONTACT CHECK (Not available on Model 2634B)

<table>
<thead>
<tr>
<th>Speed</th>
<th>Maximum Measurement Time to Memory For 60Hz (50Hz)</th>
<th>Accuracy (1 Year) 23°C ±5°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST</td>
<td>1 (1.2) ms</td>
<td>±(0%rdg. + ohms)</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>4 (5) ms</td>
<td>±(0%rdg. + ohms)</td>
</tr>
<tr>
<td>SLOW</td>
<td>36 (42) ms</td>
<td>±(0%rdg. + ohms)</td>
</tr>
</tbody>
</table>

ADDITIONAL METER SPECIFICATIONS

MAXIMUM LOAD IMPEDANCE:
Normal Mode: 10mF (typical). High Capacitance Mode: 50µF (typical).

COMMON MODE VOLTAGE: 250VDC.

COMMON MODE ISOLATION: >1GΩ, <1500pF.

OVERRANGE: 101% of source range. 102% of measure range.

MAXIMUM SENSE LEAD RESISTANCE: 1kΩ for rated accuracy.

SENSE INPUT IMPEDANCE: >10¹ Ω.
2634B, 2635B, 2636B
System SourceMeter® SMU (Source-Measure Unit) Instruments

METER SPECIFICATIONS (continued)

NOTES
16. Add 50 µV to source accuracy specifications per volt of HI lead drop.
17. Deviate accuracy specifications for NPLC setting <1 by increasing error term. Add appropriate % of range term using table below.

<table>
<thead>
<tr>
<th>NPLC Setting</th>
<th>200mV Range</th>
<th>2V–200V Range</th>
<th>100mA Range</th>
<th>1µA–100µA Range</th>
<th>1A–1.5A Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
</tr>
<tr>
<td>0.01</td>
<td>0.08%</td>
<td>0.07%</td>
<td>0.01%</td>
<td>0.05%</td>
<td>0.05%</td>
</tr>
<tr>
<td>0.001</td>
<td>0.8 %</td>
<td>0.6%</td>
<td>1%</td>
<td>0.5%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

18. Applies when in single channel display mode.
19. High Capacitance Mode accuracy is applicable at 23°C ±5°C only.
20. Applies when in single channel display mode.
21. Four-wire remote sense only and with current meter mode selected. Voltage measure set to 200mV or 2V range only.
22. 10–NPLC, 11-Point Median Filter, <200kHz range, measurements made within 1 hour after zeroing. 23°C ±1°C
23. Under default specification conditions ±0.15% + 1µA.
24. Under default specification conditions ±0.15% + 1µA.
25. 10A range accessible only in pulse mode.
26. Delay factor set to 1. Compliance equal to 100mA.
27. Includes measurement of SENSE HI to HI and SENSE LO to LO contact resistances.

HIGH CAPACITANCE MODE 29, 30, 31

VOLTAGE SOURCE OUTPUT SETTLING TIME: Time required to reach within 0.1% of final value after source level command is processed on a fixed range. Current limit = 1A.

<table>
<thead>
<tr>
<th>Voltage Source Range</th>
<th>Setting Time with C_loss = 4.7µF</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>600 µs (typical)</td>
</tr>
<tr>
<td>2 V</td>
<td>600 µs (typical)</td>
</tr>
<tr>
<td>20 V</td>
<td>1.5 ms (typical)</td>
</tr>
<tr>
<td>200 V</td>
<td>20 ms (typical)</td>
</tr>
</tbody>
</table>

CURRENT MEASURE SETTLING TIME: Time required to reach within 0.1% of final value after voltage source is stabilized on a fixed range. Values below for V_out = 2V unless noted.

<table>
<thead>
<tr>
<th>Current Measure Range</th>
<th>Setting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 A – 1 A</td>
<td>&lt;120 µs (typical) (R_in &gt;6Ω)</td>
</tr>
<tr>
<td>100 mA – 10 mA</td>
<td>&lt;100 µs (typical)</td>
</tr>
<tr>
<td>1 µA</td>
<td>&lt;3 ms (typical)</td>
</tr>
<tr>
<td>100 µA</td>
<td>&lt;3 ms (typical)</td>
</tr>
<tr>
<td>1 µA</td>
<td>&lt;3 ms (typical)</td>
</tr>
</tbody>
</table>

CAPACITOR LEAKAGE PERFORMANCE USING HIGH-C SCRIPTS 32: Load = 5µF [10Ω/2].

Test: 5V step and measure. 200ms (typical) @ 50mA.

MODE CHANGE DELAY:
100µA Current Range and Above:
Delay into High Capacitance Mode: 10ms.
Delay into High Capacitance Mode: 10ms.
1µA and 10µA Current Ranges:
Delay into High Capacitance Mode: 230ms.
Delay out of High Capacitance Mode: 10ms.

VOLTMETER INPUT IMPEDANCE: 90GΩ in parallel with 3300pF.

NOISE, 10Hz–20MHz (20V Range and below): <400mV + 0.1% of larger range (typical). Overshoot into a 200kΩ load, 200MHz BW.

NOTES
29. High Capacitance Mode specifications are for DC measurements only. 30. 10mA range and below are not available in high capacitance mode.
31. High Capacitance Mode utilizes locked ranges. Auto Range is disabled.

SEE PAGES 14 AND 15 FOR MEASUREMENT SPEEDS AND OTHER SPECIFICATIONS.

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A Greater Measure of Confidence
**Series 2600B**

*System SourceMeter® SMU (Source-Measure Unit) Instruments*

Applicable to Models 2601B, 2602B, 2604B, 2611B, 2612B, 2614B, 2634B, 2635B, and 2636B.

**MEASUREMENT SPEED SPECIFICATIONS 1, 2, 3**

**MAXIMUM SWEEP OPERATION RATES (operations per second) FOR 60Hz (50Hz):**

<table>
<thead>
<tr>
<th>A/D Converter Speed</th>
<th>Measure To Memory Using User Scripts</th>
<th>Measure To GPIB Using User Scripts</th>
<th>Source Measure To Memory Using User Scripts</th>
<th>Source Measure To GPIB Using User Scripts</th>
<th>Source Measure To Memory Using Sweep API</th>
<th>Source Measure To GPIB Using Sweep API</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001 NPLC</td>
<td>Internal 20000 (20000)</td>
<td>10500 (10500)</td>
<td>7000 (7000)</td>
<td>6200 (6200)</td>
<td>12000 (12000)</td>
<td>9000 (9000)</td>
</tr>
<tr>
<td>0.001 NPLC</td>
<td>Digital I/O 8100 (8100)</td>
<td>7100 (7100)</td>
<td>5500 (5500)</td>
<td>5100 (5100)</td>
<td>11200 (11200)</td>
<td>5700 (5700)</td>
</tr>
<tr>
<td>0.01 NPLC</td>
<td>Internal 5000 (4000)</td>
<td>4000 (3500)</td>
<td>3400 (3000)</td>
<td>3200 (2900)</td>
<td>4200 (3700)</td>
<td>3100 (2800)</td>
</tr>
<tr>
<td>0.01 NPLC</td>
<td>Digital I/O 5650 (5200)</td>
<td>5400 (5000)</td>
<td>5000 (2700)</td>
<td>2900 (2600)</td>
<td>4500 (3500)</td>
<td>3600 (2775)</td>
</tr>
<tr>
<td>0.1 NPLC</td>
<td>Internal 580 (490)</td>
<td>500 (475)</td>
<td>550 (465)</td>
<td>590 (460)</td>
<td>575 (480)</td>
<td>545 (460)</td>
</tr>
<tr>
<td>0.1 NPLC</td>
<td>Digital I/O 560 (470)</td>
<td>450 (460)</td>
<td>540 (450)</td>
<td>540 (450)</td>
<td>570 (480)</td>
<td>545 (460)</td>
</tr>
<tr>
<td>1.0 NPLC</td>
<td>Internal 59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
</tr>
<tr>
<td>1.0 NPLC</td>
<td>Digital I/O 58 (48)</td>
<td>58 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
<td>59 (49)</td>
</tr>
</tbody>
</table>

**MAXIMUM SINGLE MEASUREMENT RATES (operations per second) FOR 60Hz (50Hz):**

<table>
<thead>
<tr>
<th>A/D Converter Speed</th>
<th>Trigger Origin</th>
<th>Measure To GPIB</th>
<th>Source Measure To GPIB</th>
<th>Source Measure Pass/Fail To GPIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.001 NPLC</td>
<td>Internal 1900 (1800)</td>
<td>1400 (1400)</td>
<td>1400 (1400)</td>
<td></td>
</tr>
<tr>
<td>0.01 NPLC</td>
<td>Internal 150 (1400)</td>
<td>1200 (1100)</td>
<td>1100 (1100)</td>
<td></td>
</tr>
<tr>
<td>0.1 NPLC</td>
<td>Internal 450 (390)</td>
<td>425 (370)</td>
<td>425 (375)</td>
<td></td>
</tr>
<tr>
<td>1.0 NPLC</td>
<td>Internal 58 (48)</td>
<td>57 (48)</td>
<td>57 (48)</td>
<td></td>
</tr>
</tbody>
</table>

**TRIGGERING AND SYNCHRONIZATION SPECIFICATIONS 1**

**TRIGGERING:**
- Trigger in to trigger out: 0.5µs, typical.
- Trigger in to source change: 10µs, typical.
- Trigger Timer accuracy: ±2µs, typical.
- Source change after LXI Trigger: 280µs, typical.

**SYNCHRONIZATION:**
- Single-node synchronized source change: <0.5µs, typical.
- Multi-node synchronized source change: <0.5µs, typical.

**NOTES**

1. TSP-Link not available on Models 2604B, 2614B, and 2634B.
2. Fixed source range, with no polarity change.
Series 2600B Specifications

8606 High Performance Modular Probe
7078-TRX-GND 3-Slot male triax to BNC adapter
7078-TRX-* 3-Slot, Low Noise Triax Cable. For use with 2600-TRIAX Adapter
2600-BAN Banana Test Leads/Adapter Cable. For a single 2601B/2602B/2604B/2611B/2612B/2614B/2634B/2635B/2636B SMU instrument channel
2600-KIT Extra screw terminal connector, strain relief, and cover for a single SourceMeter channel (one supplied with 2601B/2611B, two with 2602B/2604B/2612B/2614B)
2600-TRIAX Triax Adapter. For a single 2601B/2602B/2604B/2611B/2612B/2614B SMU instrument channel
7078-TRX-* 3-Slot, Low Noise Triax Cable. For use with 2600-TRIAX Adapter
7077-TRX-GND 3-Slot male triax to BNC adapter (guard removed)
8606 High Performance Modular Probe Kit. For use with 2600B-BAN

Series 2600B System SourceMeter® SMU (Source-Measure Unit) Instruments

Applicable to Models 2601B, 2602B, 2604B, 2611B, 2612B, 2614B, 2634B, 2635B, and 2636B.

SUPPLEMENTAL INFORMATION

FRONT PANEL INTERFACE: Two-line vacuum fluorescent display (VFD) with keypad and rotary knob.
Display:
- Show error messages and user defined messages
- Display source and limit settings
- Show current and voltage measurements
- View measurements stored in dedicated reading buffers
Keypad Operations:
- Change host interface settings
- Save and restore instrument setups
- Load and run factory and user defined test scripts (i.e. sequences) that prompt for input and send results to the display
- Store measurements into dedicated reading buffers

PROGRAMMING: Embedded Test Script Processor (TSP) accessible from any host interface. Responds to individual instrument control commands. Responds to high speed test scripts comprised of instrument control commands and Test Script Language (TSL) statements (e.g. branching, looping, math, etc.). Able to execute high speed test scripts stored in memory without host intervention.
Minimum Memory Available: 16MB (approximately 250,000 lines of TSL code).
Test Script Builder: Integrated development environment for building, running, and managing TSP scripts. Includes an instrument console for communicating with any TSP enabled instrument in an interactive manner. Requires
- VISA (NI-VISA included on CD)
- Microsoft .NET Framework (included on CD)
- Keithley I/O Layer (included on CD)
- Pentium III 800MHz or faster personal computer
- Microsoft Windows 98, NT, 2000, or XP

SOFTWARE INTERFACE: TSP Express (embedded), Direct GPIB/VISA, READ/WRITE for VB, VC/C++, LabVIEW, LabWindows/CVI, etc.

READING BUFFERS: Dedicated storage area(s) reserved for measurement data. Reading buffers are arrays of measurement elements. Each element can hold the following items:
- Measurement
- Measurement status
- Timestamp
- Source setting (at the time the measurement was taken)
- Range information

Two reading buffers are reserved for each SourceMeter channel. Reading buffers can be filled using the front panel STORE key and retrieved using the RECALL key or host interface.

Buffer Size, with timestamp and source setting: >60,000 samples
Buffer Size, without timestamp and source setting: >140,000 samples

SYSTEM EXPANSION: The TSP-Link expansion interface allows TSP enabled instruments to trigger and communicate with each other. See figure below.

ACCESORIES AVAILABLE

CABLES AND CONNECTORS
2600-BAN Banana Test Leads/Adapter Cable. For a single 2601B/2602B/2604B/2611B/2612B/2614B SMU instrument channel
2600-KIT Extra screw terminal connector, strain relief, and cover for a single SourceMeter channel (one supplied with 2601B/2611B, two with 2602B/2604B/2612B/2614B)
2600-TRIAX Triax Adapter. For a single 2601B/2602B/2604B/2611B/2612B/2614B SMU instrument channel
7078-TRX-* 3-Slot, Low Noise Triax Cable. For use with 2600-TRIAX Adapter
7077-TRX-GND 3-Slot male triax to BNC adapter (guard removed)
8606 High Performance Modular Probe Kit. For use with 2600B-BAN

DIGITAL I/O, TRIGGER LINK, AND TSP-LINK
2600-TLINK Digital I/O to TLINK Adapter Cable, 1m
CA-126-1 Digital I/O and Trigger Cable, 1.5m
CA-180-3A CAT5 Crossover Cable for TSP-Link and direct Ethernet connection (two supplied)

GPIB INTERFACES AND CABLES
7007-1 Double Shielded GPIB Cable, 1m (3 ft.)
7007-2 Double Shielded GPIB Cable, 2m (6.6 ft.)
KPCI-488PA IEEE-488 Interface/Controller for the PCI Bus

SWITCHING
Series 3700 DMM/Switch Systems
707B Semiconductor Switching Matrix/Mainframe

RACK MOUNT KITS
4299-1 Single Rack Mount Kit with front and rear support
4299-2 Dual Rack Mount Kit with front and rear support
4299-5 IU Vent Panel

SOFTWARE
ACS-BASIC Component Characterization Software

EXTENDED WARRANTIES
2601B-EW 1 Year Extended Warranty for Model 2601B
2602B-EW 1 Year Extended Warranty for Model 2602B
2604B-EW 1 Year Extended Warranty for Model 2604B
2611B-EW 1 Year Extended Warranty for Model 2611B
2612B-EW 1 Year Extended Warranty for Model 2612B
2614B-EW 1 Year Extended Warranty for Model 2614B
2634B-EW 1 Year Extended Warranty for Model 2634B
2655B-EW 1 Year Extended Warranty for Model 2655B
2656B-EW 1 Year Extended Warranty for Model 2656B

CALIBRATION AND VERIFICATION
2600-STD-RES Calibration Standard 1G

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Series 2600B

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(Source-Measure Unit) Instruments

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