

Agilent B2900A Series Precision Source/Measure Unit

Data Sheet



*Cost-effective
source/measurement
solutions offer superior
performance and a
best-in-class graphical
user interface*

- Integrated voltage/current 4-quadrant precision source and measurement capabilities for easy and accurate I/V measurement
- Wide coverage up to 210 V, 3 A DC/10.5 A pulse
- 10 fA/100 nV minimum measurement resolution (6½ digits)
- 10 fA/100 nV minimum sourcing resolution (6½ digits)
- The 4.3" front panel color display supports both graphical and numerical view modes
- High resolution arbitrary waveform generation (AWG) and list sweep functions (10 µs minimum interval)
- High speed digitizing capability (maximum 100000 points/s sample rate)
- Free application software to facilitate PC -based instrument control
- IVI-COM drivers, and SCPI supporting conventional SMU command set for basic compatibility
- LXI class C, USB2.0, GPIB, LAN and digital I/O interface



Agilent Technologies

Introduction

The Agilent B2900A Series of Precision Source/Measure Units are compact and cost-effective bench-top Source/Measure Units (SMUs) with the capability to output and measure both voltage and current. An SMU combines the capabilities of a current source, a voltage source, a current meter and a voltage meter along with the capability to switch easily between these various functions into a single instrument. The Agilent B2900A series of SMUs provide best-in-class performance at a lower price than ever before. They have

broad voltage (210 V) and current (3 A DC and 10.5 A pulsed) sourcing capability, excellent precision (minimum 10 fA/100 nV sourcing and measuring resolution) and high measurement throughput. They also support an arbitrary waveform generation function. In addition, the Agilent B2900A series possess a superior graphical user interface with various viewing modes that dramatically improve test productivity, debug and characterization. The versatile integrated source and measurement capabilities of the Agilent B2900 series SMUs make them an ideal choice for testing

semiconductors, active/passive components and a variety of other devices and materials. The B2900 series has a broad application range that spans from R&D and education uses to industrial development, test and manufacturing. Moreover, they work equally well as either standalone or system components. The Agilent B2900A series consists of four models, the B2901A, B2902A, B2911A and B2912A, differentiated through their available features (number of digits displayed, measurement resolution, minimum timing interval, supported viewing modes, etc.) and by the number of SMU channels (one or two) they contain. This makes it easy to select the exact price/performance point to meet your testing needs.

Key Specifications of B2900A Series

| | | | B2901A | B2902A | B2911A | B2912A |
|---|----------------|---------|------------------------|------------------------|-------------------------|-------------------------|
| Number of channels | | | 1 | 2 | 1 | 2 |
| Max output | Voltage | | 210 V | 210 V | 210 V | 210 V |
| | Current | DC | 3.03 A | 3.03 A | 3.03 A | 3.03 A |
| | | Pulsed | 10.5 A | 10.5 A | 10.5 A | 10.5 A |
| | Power | | 31.8 W | 31.8 W | 31.8 W | 31.8 W |
| Source | Max digits | Digits | 5½ | 5½ | 6½ | 6½ |
| | Min resolution | Voltage | 1 µV | 1 µV | 100 nV | 100 nV |
| | | Current | 1 pA | 1 pA | 10 fA | 10 fA |
| Measurement | Max digits | Digits | 6½ | 6½ | 6½ | 6½ |
| | Min resolution | Voltage | 100 nV | 100 nV | 100 nV | 100 nV |
| | | Current | 100 fA | 100 fA | 10 fA | 10 fA |
| Min programmable interval for List sweep/AWG waveform | | | 20 µs | 20 µs | 10 µs | 10 µs |
| Min trigger interval for digitizing (Max sample rate) | | | 20 µs (50000 pts/s) | 20 µs (50000 pts/s) | 10 µs (100000 pts/s) | 10 µs (100000 pts/s) |
| View Modes | Single view | | ✓ | ✓ | ✓ | ✓ |
| | Dual view | | | ✓ | | ✓ |
| | Graph view | | ✓ | ✓ | ✓ | ✓ |
| | Roll view | | | | ✓ | ✓ |

Specifications

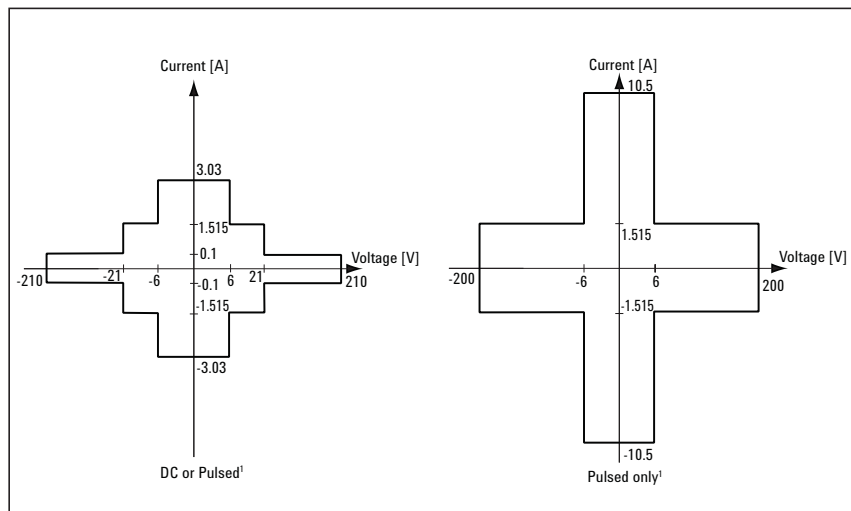
Specification conditions

The source and measurement accuracy are specified under the conditions listed below.

1. Temperature: 23 °C ± 5 °C
2. Humidity: 30 % to 80 % RH
3. After 60 minutes warm-up
4. Ambient temperature change less than ±3 °C after self-calibration execution
5. Calibration period: 1 year
6. Measurement speed: 1 PLC (Power Line Cycle)

Maximum voltage and current

| | Max Voltage | Max Current |
|---------------------------|-------------|----------------------|
| DC or Pulsed ¹ | 210 V | 0.105 A |
| | 21 V | 1.515 A ² |
| | 6 V | 3.03 A ² |
| Pulsed only ¹ | 200 V | 1.515 A |
| | 6 V | 10.5 A |



1. See "Maximum pulse width and duty cycle" in Pulse Source Supplemental Characteristics for applicable maximum voltage and current.
2. Max current limitation: For 21 V/1.515 A and 6 V / 3.03 A ranges, total max current is limited by the table below for using 2 channels. Max current is not limited for using 1 channel only.

Maximum current limitation

| Ch1 voltage | Ch2 voltage | Max total current limitation of Ch1 and Ch2 |
|-------------------|-------------------|---|
| ±(0 V < V ≤ 6 V) | ±(0 V < V ≤ 6 V) | Ch1 current + Ch2 current ≤ 4 A |
| ±(0 V < V ≤ 6 V) | ±(6 V < V ≤ 21 V) | Ch1 current + Ch2 current × 1.6 ≤ 4 A |
| ±(6 V < V ≤ 21 V) | ±(0 V < V ≤ 6 V) | Ch1 current + Ch2 current × 0.625 ≤ 2.5 A |
| ±(6 V < V ≤ 21 V) | ±(6 V < V ≤ 21 V) | Ch1 current + Ch2 current ≤ 2.5 A |

Source Specifications

Voltage source specifications

| Range | Programming Resolution | | Accuracy (% reading + offset) | Noise (peak to peak) 0.1 Hz to 10 Hz ¹ | Max Voltage (over range) |
|---------|------------------------|---------------|----------------------------------|---|-----------------------------|
| | B2901A/B2902A | B2911A/B2912A | | | |
| ±200 mV | 1 µV | 100 nV | ±(0.015 % + 225 µV) | ≤ 10 µV | ±210 mV |
| ±2 V | 10 µV | 1 µV | ±(0.02 % + 350 µV) | ≤ 20 µV | ±2.1 V |
| ±20 V | 100 µV | 10 µV | ±(0.015 % + 5 mV) | ≤ 200 µV | ±21 V |
| ±200 V | 1 mV | 100 µV | ±(0.015 % + 50 mV) | ≤ 2 mV | ±210 V |

1. Supplemental characteristics

Current source specifications

| Range | Programming Resolution | | Accuracy (% reading + offset) | Noise (peak to peak) 0.1 Hz to 10 Hz ¹ | Max Current (over range) |
|---------------------|------------------------|---------------|----------------------------------|---|-----------------------------|
| | B2901A/B2902A | B2911A/B2912A | | | |
| ±10 nA ² | --- | 10 fA | ±(0.10 % + 50 pA) | ≤ 1 pA | ±10.5 nA |
| ±100 nA | 1 pA | 100 fA | ±(0.06 % + 100 pA) | ≤ 2 pA | ±105 nA |
| ±1 µA | 10 pA | 1 pA | ±(0.025 % + 500 pA) | ≤ 25 pA | ±1.05 µA |
| ±10 µA | 100 pA | 10 pA | ±(0.025 % + 1.5 nA) | ≤ 60 pA | ±10.5 µA |
| ±100 µA | 1 nA | 100 pA | ±(0.02 % + 25 nA) | ≤ 2 nA | ±105 µA |
| ±1 mA | 10 nA | 1 nA | ±(0.02 % + 200 nA) | ≤ 6 nA | ±1.05 mA |
| ±10 mA | 100 nA | 10 nA | ±(0.02 % + 2.5 µA) | ≤ 200 nA | ±10.5 mA |
| ±100 mA | 1 µA | 100 nA | ±(0.02 % + 20 µA) | ≤ 600 nA | ±105 mA |
| ±1 A | 10 µA | 1 µA | ±(0.03 % + 1.5 mA) | ≤ 70 µA | ±1.05 A |
| ±1.5 A | 10 µA | 1 µA | ±(0.05 % + 3.5 mA) | ≤ 100 µA | ±1.515 A |
| ±3 A | 100 µA | 10 µA | ±(0.4 % + 7 mA) | ≤ 120 µA | ±3.03 A |
| ±10 A ³ | 100 µA | 10 µA | ±(0.4 % + 25 mA) ⁴ | | ±10.5 A |

1. Supplemental characteristics

2. 10 nA range is not available for B2901A/B2902A.

3. 10 A range is available only for pulse mode, not available for DC mode.

4. Measurement speed: 0.01 PLC

Source Supplemental Characteristics

Temperature coefficient (0 °C to 18 °C and 28 °C to 50 °C):

$\pm(0.1 \times \text{Accuracy specification}) / ^\circ\text{C}$.

Max output power and source/sink limits:

31.8 W

$\pm 6 \text{ V} @ \pm 3.03 \text{ A}$, $\pm 21 \text{ V} @ \pm 1.515 \text{ A}$, $\pm 210 \text{ V} @ \pm 105 \text{ mA}$, four quadrant source or sink operation.

Current limit/compliance:

Accuracy is same as current source. Minimum value is 1 % of range, or 1 nA in 10 nA range.

Voltage limit/compliance:

Accuracy is same as voltage source. Minimum value is 1 % of range, or 20 mV in 200 mV range

Over range :

101 % of source range for 1.5 A and 3 A ranges. 105 % of source range other than 1.5 A and 3 A ranges. No over range for 200 V range with current exceeding 105 mA pulse only condition.

Over temperature protection:

Output turns off then resets at over temperature sensed internally.

Voltage output settling time:

Time required to reach within 0.1 % of final value at open load condition.

Step is 10 % to 90 % range

200 mV, 2 V Ranges: <50 μs

20 V Range: <110 μs

200 V Range:<700 μs

Current output settling time:

Time required to reach within 0.1 % (0.3 % for 3 A range) of final value at short condition. Step is 10 % to 90 % range

10 nA, 100 nA Ranges: <10 ms

1 μA Range: <500 μs

10 μA , 100 μA Ranges:<250 μs

1mA to 3 A Ranges:<80 μs

Noise 10 Hz to 20 MHz (V source): 3 mVrms, 20 V range.

V source overshoot:

< $\pm(0.1 \% + 10 \text{ mV})$. Step is 10 % to 90 % range, resistive load.

I source overshoot:

< $\pm 0.1 \%$ (< $\pm 0.3 \%$ for 3 A range). Step is 10 % to 90 % range, resistive load.

Voltage source range change overshoot:

$\leq 250 \text{ mV}$. 100 k Ω load, 20 MHz bandwidth

Current source range change overshoot:

$\leq 250 \text{ mV/R load}$, 20 MHz bandwidth

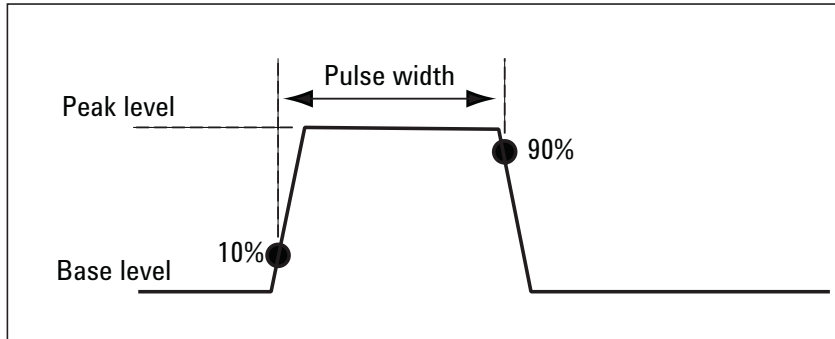
Pulse Source Supplemental Characteristics

Minimum programmable pulse width: 50 μ s

Pulse width programming resolution: 1 μ s

Pulse width definition:

The time from 10 % leading to 90 % trailing edge as follows.



Maximum pulse width and duty cycle:

| | Pulsed | | | | | DC | |
|--------------|-------------|----------------------|----------------------|-------------------------|----------------|-------------|----------------------|
| | Max Voltage | Max Peak Current | Max Base Current | Pulse Width | Max Duty Cycle | Max Voltage | Max Current |
| DC or pulsed | 210 V | 0.105 A | 0.105 A | 50 μ s to 99999.9 s | 99.9999 % | 210 V | 0.105 A |
| | 21 V | 1.515 A ¹ | 1.515 A ¹ | 50 μ s to 99999.9 s | 99.9999 % | 21 V | 1.515 A ¹ |
| | 6 V | 3.03 A ¹ | 3.03 A ¹ | 50 μ s to 99999.9 s | 99.9999 % | 6 V | 3.03 A ¹ |
| Pulsed only | 200 V | 1.515 A | 50 mA | 50 μ s to 2.5 ms | 2.5 % | | |
| | 180 V | 1.05 A | 50 mA | 50 μ s to 10 ms | 2.5 % | | |
| | 6 V | 10.5 A | 0.5 A | 50 μ s to 1 ms | 2.5 % | | |

1. Max current limitation: For 21 V/1.515 A and 6 V / 3.03 A ranges, total max current is limited by the table in page 3 for using 2 channels. Max current is not limited for using 1 channel only.

Minimum pulse width at the given voltage, current and settling conditions:

| Source Value | Limit Value | Load | Source Settling (% of range) | Min Pulse Width |
|--------------|-------------|--------------|------------------------------|-----------------|
| 200 V | 1.5 A | 200 Ω | 0.1 % | 1 ms |
| 6 V | 10.5 A | 0.6 Ω | 0.1 % | 0.2 ms |
| 1.5 A | 200 V | 65 Ω | 0.1 % | 2.5 ms |
| 10.5 A | 6 V | 0.5 Ω | 0.1 % | 0.2 ms |

Measurement Specifications

Voltage Measurement Specifications

| Range | Measurement Resolution | | Accuracy (% reading + offset) |
|---------|------------------------|---------------|----------------------------------|
| | B2901A/B2902A | B2911A/B2912A | |
| ±200 mV | 100 nV | 100 nV | ±(0.015 % + 225 µV) |
| ±2 V | 1 µV | 1 µV | ±(0.02 % + 350 µV) |
| ±20 V | 10 µV | 10 µV | ±(0.015 % + 5 mV) |
| ±200 V | 100 µV | 100 µV | ±(0.015 % + 50 mV) |

1. Supplemental characteristics

Current Measurement Specifications

| Range | Measurement Resolution | | Accuracy (% reading + offset) |
|---------------------|------------------------|---------------|----------------------------------|
| | B2901A/B2902A | B2911A/B2912A | |
| ±10 nA ¹ | --- | 10 fA | ±(0.10 % + 50 pA) |
| ±100 nA | 100 fA | 100 fA | ±(0.06 % + 100 pA) |
| ±1 µA | 1 pA | 1 pA | ±(0.025 % + 500 pA) |
| ±10 µA | 10 pA | 10 pA | ±(0.025 % + 1.5 nA) |
| ±100 µA | 100 pA | 100 pA | ±(0.02 % + 25 nA) |
| ±1 mA | 1 nA | 1 nA | ±(0.02 % + 200 nA) |
| ±10 mA | 10 nA | 10 nA | ±(0.02 % + 2.5 µA) |
| ±100 mA | 100 nA | 100 nA | ±(0.02 % + 20 µA) |
| ±1 A | 1 µA | 1 µA | ±(0.03 % + 1.5 mA) |
| ±1.5 A | 1 µA | 1 µA | ±(0.05 % + 3.5 mA) |
| ±3 A | 10 µA | 10 µA | ±(0.4 % + 7 mA) |
| ±10 A ² | 10 µA | 10 µA | ±(0.4 % + 25 mA) ³ |

1. 10 nA range is not available for B2901A/B2902A.

2. 10 A range is available only for pulse mode, not available for DC mode.

3. Measurement speed: 0.01 PLC

Measurement Supplemental Characteristics

Temperature coefficient (0 °C to 18 °C and 28 °C to 50 °C):

$\pm(0.1 \times \text{Accuracy specification}) / ^\circ\text{C}$.

Over range :

102 % of measurement range for 1.5 A and 3 A ranges. 106 % of measurement range other than 1.5 A and 3 A ranges.

Voltage measurement range change overshoot:

< 250 mV. 100 k Ω load, 20 MHz bandwidth

Current measurement range change overshoot:

<250 mV/R load , 20 MHz bandwidth

Derating accuracy for measurement speed less than 1 PLC :

Add % of range using the following table for measurement with PLC <1.

Derating accuracy with PLC setting < 1 PLC

| | Voltage Range | | Current Range | | | |
|-----------|---------------|--------------|---------------|--------|---------------------|------------|
| | 0.2 V | 2 V to 200 V | 10 nA | 100 nA | 1 μ A to 100 mA | 1 A to 3 A |
| 0.1 PLC | 0.01 % | 0.01 % | 0.1 % | 0.01 % | 0.01 % | 0.01 % |
| 0.01 PLC | 0.05 % | 0.02 % | 1 % | 0.1 % | 0.05 % | 0.02 % |
| 0.001 PLC | 0.5 % | 0.2 % | 5 % | 1 % | 0.5 % | 0.2 % |

Triggering and Timing Specifications

Triggering

Digital I/O Trigger in to trigger out¹: $\leq 5 \mu\text{s}$

Digital I/O Trigger in to source change¹: $\leq 5 \mu\text{s}$

LXI Trigger in to source change¹: $\leq 200 \mu\text{s}$

1. Supplemental Characteristics

Timer

Trigger timing resolution: 1 μs to 100 ms

Timer accuracy: ± 50 ppm

Arm/trigger delay: 0 to 100000 s

Arm/trigger interval:

B2901A/B2902A: 20 μs to 100000 s

B2911A/B2912A: 10 μs to 100000 s

Arm/trigger event: 1 to 100000

Time stamp:

TIMER value automatically saved when each measurement is triggered.

Other Supplemental Characteristics

Output Characteristics

Sensing Modes: 2-wire or 4-wire (Remote-sensing) connections

Low terminal connection: Chassis grounded or floating

Output connectors:

Banana jack. Triaxial connections are recommended for sourcing and measuring less than 1 nA. A banana jack to triaxial adapter is available for low current measurement.

Output location: Channel 1 at front, and channel 2 at rear.

Maximum load:

Normal mode: 0.01 μF

High Capacitance mode: 50 μF

DC floating voltage: Max ± 250 V DC between low force and chassis ground.

Guard offset voltage (V source): < 4 mV

Remote sense operation range:

Max voltage between High Force and High Sense = 3 V

Max voltage between Low Force and Low Sense = 3 V

Common mode isolation: > 1 G Ω , < 4500 pF

Maximum sense lead resistance: 1k Ω for rated accuracy

Sense input impedance: > 10 G Ω

High Capacitance Mode

The high capacitance mode permits the measurement of devices with capacitances greater than the normal mode maximum load value of 0.01 μF . In high capacitance mode the maximum allowed value of the load capacitance is 50 μF .

Voltage output settling time:

Time required to reach within 0.1 % of final value with 4.7 μF capacitive load on a fixed range at specified current range and limit value.

200 mV, 2 V Ranges: 600 μs , at 1 A limit

20 V Range: 1.5 ms, at 1 A limit

200 V Range: 20 ms, at 100 mA limit

Current measurement settling time:

Time required to reach within 0.1 % of final value after voltage source is stabilized on fixed range. Vout is 5 V unless noted.

1 μA Range: 230 ms

10 μA , 100 μA Ranges: 23 ms

1 mA, 10 mA Ranges: 0.23 ms

100 mA to 3 A Ranges: 100 μs

Mode change delay:

Delay into High Cap mode:

1 μA Range: 230 ms

10 μA , 100 μA Ranges: 23 ms

1 mA to 3 A Ranges: 1 ms

Delay out of High Cap mode:

All ranges: 10 ms

Noise 10 Hz to 20 MHz (20 V range): 4.5 mVrms

Voltage source range change overshoot (20 V range or below):

< 250 mV, 20 MHz bandwidth

High Capacitance mode working conditions:

V/I mode: Voltage source mode only

Range: Current measurement range is limited to fixed range only. 10 nA and 100 nA ranges are not available.

Current limit: ≥ 1 μA

Resistance Measurement

Resistance measurement can be performed under either auto or manual test conditions. Auto resistance measurement is performed in current source and voltage measurement mode. The total auto resistance measurement error is shown in the table below. The total error of a manual resistance measurement can be calculated using the voltage and current accuracy information as shown below.

Source I mode, manual ohm measurement (4-wire):

$$\text{Total error} = V_{\text{meas}}/I_{\text{src}} = R \text{ reading} \times (\text{gain error \% of V range} + \text{gain error \% of I range} + \text{offset error of I range} / I_{\text{src}} \text{ value \%}) + (\text{offset error of V range} / I_{\text{src}} \text{ value})$$

Source V mode, manual ohm measurement (4-wire):

$$\text{Total error} = V_{\text{src}}/I_{\text{meas}} = 1 / [1/R \text{ reading} \times (\text{gain error \% of I range} + \text{gain error \% of V range} + \text{offset error of V range} / V_{\text{src}} \text{ value \%}) + (\text{offset error of I range} / V_{\text{src}} \text{ value})]$$

Measurement speed = 1 PLC

Applicable for temperature: 23 °C ± 5 °C

Example of total error calculation:

I Source value = 1 mA at 1 mA range

V measure range = 2 V range

$$\text{Total error (\% reading + offset)} = (0.02 \% + 0.02 \% + 200 \text{ nA}/1 \text{ mA}) + (350 \mu\text{V}/1 \text{ mA}) = 0.06 \% + 0.35 \Omega$$

Typical Performance of Auto Resistance Measurement (4-wire), 2 V range

| Range | Resolution | Test Current | Current Range | Total Error (% reading + offset) |
|--------|------------|--------------|---------------|----------------------------------|
| 2 Ω | 1 μΩ | 1 A | 1 A | 0.2 % + 0.00035 Ω |
| 20 Ω | 10 μΩ | 100 mA | 100 mA | 0.06 % + 0.0035 Ω |
| 200 Ω | 100 μΩ | 10 mA | 10 mA | 0.065 % + 0.035 Ω |
| 2 kΩ | 1 mΩ | 1 mA | 1 mA | 0.06 % + 0.35 Ω |
| 20 kΩ | 10 mΩ | 100 μA | 100 μA | 0.065 % + 3.5 Ω |
| 200 kΩ | 100 mΩ | 10 μA | 10 μA | 0.06 % + 35 Ω |
| 2 MΩ | 1 Ω | 1 μA | 1 μA | 0.095 % + 350 Ω |
| 20 MΩ | 10 Ω | 100 nA | 100 nA | 0.18 % + 3.5 kΩ |
| 200 MΩ | 100 Ω | 10 nA | 10 nA | 1.08 % + 35 kΩ |

System Speeds

Maximum Sweep Operation Reading Rates (reading/second) for 50 Hz

| Measure Speed | Measure To Memory | Measure To GPIB | Source Measure To Memory | Source Measure To GPIB |
|---------------|-------------------|-----------------|--------------------------|------------------------|
| < 0.001 PLC | 20000 | 12500 | 19500 | 12500 |
| 0.01 PLC | 4500 | 3950 | 4500 | 3950 |
| 0.1 PLC | 500 | 490 | 500 | 490 |
| 1 PLC | 49 | 49 | 49 | 49 |

Operation reading rate varies by number of sweep steps. Number of sweep steps is specified from 1 to 2500.

General Specifications

| |
|--|
| Environment |
| For use in indoor facilities |
| Temperature Range |
| Operating: 0 °C to +55 °C |
| Storage: -30 °C to +70 °C |
| Humidity Range |
| Operating: 30 % to 80 % RH, non-condensing |
| Storage: 10 % to 90 % RH, non-condensing |
| Altitude |
| Operating: 0 m to 2000 m |
| Storage: 0 m to 4600 m |
| Power Supply |
| AC voltage: 90 V to 264 V |
| Line frequency: 47 Hz to 63 Hz |
| Maximum volt-amps: 250 VA |
| Cooling |
| Forced air. Side intake and rear exhaust. |
| EMC |
| IEC61326-1/EN61326-1 |
| AS/NZS CISPR 11 |
| Safety |
| IEC61010-1/EN61010-1 |
| CAN/CSA-C22.2 No. 61010-1-04, C/US |
| Certifications |
| CE, cCSAus, C-Tick |
| Dimensions |
| Without handle & feet: 88 mm H x 213 mm W x 450 mm D |
| Bench Configuration (with handle & feet): 180 mm H x 260 mm W x 480 mm D |
| Weight |
| B2901A/B2911A: 5.0 kg |
| B2902A/B2912A: 6.4 kg |

Operation and Functions

Front Panel Interface

4.3" Color TFT WQVGA (480x272, with LED backlight) provides a graphical user interface (GUI) with the following features.

- 4-View Modes (Single, Dual, Graph, Roll view)
- Easy-to-use key operations
- Easy access to basic and advanced source/measurement capabilities

Single view

Single view provides basic and advanced settings and display capabilities for the selected channel from the front panel of the instrument. No additional controller or software is required.

Dual view

Dual view provides the basic settings and display capabilities for both channels 1 and 2. Up to 6½ digits can be displayed in dual view mode. This mode is available only for the B2902A/B2912A.

Operation and Functions cont'd

Graph View

Graph View displays measurement results on XY graphs (such as I-V and I-t/V-t curves) on up to 2 channels. This is useful for quick evaluation of device characteristics, especially those obtained from sweep measurements.

Roll View

Roll view draws I-t or V-t curves similar to the curves drawn by a strip chart recorder. Up to 1000 acquired data points can be displayed and updated while the measurement is still in progress. Roll view's continuous measurement capability is especially useful for monitoring low frequency phenomena. Roll view is available only for the B2911A/B2912A.

Easy-to-use Key Operations

- 10-key, assist key and rotary knob for easy operation.
- 10-key enables direct input of alphanumeric values.
- Assist key guides operation on the front panel.

Easy Access to Source/Measurement Capabilities

Settings:

- V/I source mode
- Source value
- Limit (compliance) value
- Sweep parameters
- Pulse parameters
- Measure speed
- Range setting
- Trigger setting

Result Displays:

- Numeric results fully up to 6½ digits both in Single and Dual view modes
- Characterization in Graph View and Roll View
- Data list

Advanced Capabilities:

- Limit testing by user definable limits working with component handlers
- Trace memory for accumulating measurement (or math) result and collecting their statistics

File Operations (USB memory):

- Save
 - System Configuration
 - Measurement/Math result
 - Limit test result
 - Trace data
 - Graph screen dump
- Load
 - System configuration
 - List sweep data

Source/Measurement Capabilities

Sweep measurement

Number of steps: 1 to 2500

Sweep mode: linear, logarithmic (log) or list

Sweep direction: single or double

Type: DC, or pulse

Min programmable value to create list sweep waveform:

B2901A/B2902A: Min 20 μ s with 1 μ s resolution

B2911A/B2912A: Min 10 μ s with 1 μ s resolution

Digitizing/Sampling measurement

Digitizing/sampling measurement can be performed by appropriate setting of measure speed and trigger interval.

Min trigger interval (Max speed of measurement):

B2901A/B2902A: 20 μ s (50000 points/s)

B2911A/B2912A: 10 μ s (100000 points/s)

Data Buffers

Data buffers are array of measurement elements. Each elements hold the following values.

- Measured voltage
- Measured current
- Measured resistance
- Time stamp
- Measurement status
- Source setting

Max buffer size: 100000 points / channel

Program and Interface Capabilities

Programming Language

The Agilent B2900A series supports SCPI (Standard Commands for Programmable Instruments).

Default Command Set:

Supports all of the advanced features of Agilent B2900A series.

Conventional Command Set:

Supports industry standard conventional SCPI command set for basic compatibility

Program Memory

Program memory allows you to store long strings of SCPI command lines once into the B2900A series' volatile memory and then recall those strings multiple times while the program is executing using a single SCPI command. By storing the command strings in memory, the time that would have been spent sending those same commands over a communication bus is eliminated. For tests that utilize lots of repeated code (such as subroutines), program memory can dramatically reduce test times.

Max number of characters of program name:

32, with alphabets, numbers, hyphens and underscores.

Max memory size: 100 kB (2500 lines typical)

LXI

LXI Class-C compliant. The Agilent B2900A series follows specified LAN protocols and adhere to LXI requirements such as a built-in Web control server and IVI-COM driver.

Program and Interface Capabilities cont'd

Ethernet: 10/100Base-T

USB2.0: USB-TMC488 protocol (Rear x 1)

GPIB: IEEE-488.2 compliant

USB file system

USB 2.0 high-speed mass storage (MSC) class device (Front x 1)

Digital I/O interface

Connector: 25-pin female D.

Input/output pins: 14 open drain I/O bits

Absolute max input voltage: 5.25 V

Absolute min input voltage: - 0.25 V

Max logic low input voltage: 0.8 V

Min logic high input voltage: 2.0 V

Max source current: 1 mA, $V_{out} = 0$ V

Max sink current: 50 mA, $V_{out} = 5$ V

5 V power supply pin:

Limited to 600 mA, solid state fuse protected.

Safety interlock pin:

One active high pin and one active low pin. Activation of both pin enables output voltage > 42 V.

Furnished accessories

Power cable

USB cable

Quick Reference (English)

Product Reference CD-ROM (including PDF manuals, Agilent B2900A Quick I/V Measurement Software and drivers)

Agilent I/O Library Suite

Software and drivers

Agilent B2900A Quick I/V Measurement Software

The Agilent B2900A series includes PC-based Agilent B2900A Quick I/V Measurement Software. This powerful software makes it easy to quickly setup and perform I/V measurements and to display the measurement data in a table or graph without the need to perform any programming. The software allows you to control up to four SMU channels over a GPIB or LAN connection, or one B2900A series unit via a USB connection.

Operating environment:

Operating System:

Windows 7 (64bit/32bit), XP SP3 (32-bit).

Other requirements:

Microsoft .NET framework 4.0 or greater, and IO Libraries 16.0 or greater.

Furnished accessories cont'd

Agilent B2900A Graphical Web Interface

The Agilent B2900A Graphical Web Interface is a web browser based instrument control panel. It enables you to set up and perform a measurement easily and quickly from a web browser using the Agilent B2900A's built-in web server. This allows you to control one Agilent B2900A series unit over a LAN connection.

IVI-C or IVI-COM drivers

Compatible with Windows 7 (64bit/32bit), XP SP2 (32-bit) IO Libraries 16.0 or greater. Supports Agilent VEE, Microsoft Visual Studio (Visual Basic, Visual C++, Visual C#), National Instruments LabWindows and LabVIEW.

LabVIEW driver (VI)

National Instruments LabVIEW 7.0 or greater. LabView drivers are available at NI.COM.

Ordering Information

| Model Number | |
|--------------------------------------|--|
| B2901A | Precision Source/Measure Unit, 1ch, 100 fA, 210 V, 3 A DC/10.5 A pulse |
| B2902A | Precision Source/Measure Unit, 2ch, 100 fA, 210 V, 3 A DC/10.5 A pulse |
| B2911A | Precision Source/Measure Unit, 1ch, 10 fA, 210 V, 3 A DC/10.5 A pulse |
| B2912A | Precision Source/Measure Unit, 2ch, 10 fA, 210 V, 3 A DC/10.5 A pulse |
| Options | |
| <i>Printed Manual (User's Guide)</i> | |
| ABA | English |
| ABJ | Japanese |
| AB0 | Traditional Chinese |
| AB2 | Simplified Chinese |
| <i>Calibration</i> | |
| A6J | ANSI Z540 compliant calibration |
| UK6 | Commercial calibration certificate with test data |
| <i>Rack Mount Kit</i> | |
| 1CM | Rack mount kit |
| Accessories | |
| <i>Banana to Triaxial Adapter</i> | |
| N1294A-001 | Banana - Triax Adapter for 2-wire (non Kelvin) connection |
| N1294A-002 | Banana - Triax Adapter for 4-wire (Kelvin) connection |
| <i>Interlock cable for 16442B</i> | |
| N1294A-011 | Interlock cable for 16442B (1.5 m) |
| N1294A-012 | Interlock cable for 16442B (3.0 m) |
| <i>Test Fixture</i> | |
| N1295A | Device/Component Test Fixture |

For details of differences, refer to the comparison table in the page 2.



Agilent Advantage Services is committed to your success throughout your equipment's lifetime. We share measurement and service expertise to help you create the products that change our world. To keep you competitive, we continually invest in tools and processes that speed up calibration and repair, reduce your cost of ownership, and move us ahead of your development curve.

www.agilent.com/find/advantageservices



www.agilent.com/quality



Agilent Email Updates

www.agilent.com/find/emailupdates

Get the latest information on the products and applications you select.



www.lxistandard.org

LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Agilent is a founding member of the LXI consortium.

Agilent Channel Partners

www.agilent.com/find/channelpartners

Get the best of both worlds: Agilent's measurement expertise and product breadth, combined with channel partner convenience.

Microsoft and Windows® are U.S registered trademarks of the Microsoft Corporation.

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Americas

| | |
|---------------|----------------|
| Canada | (877) 894 4414 |
| Brazil | (11) 4197 3500 |
| Latin America | 305 269 7500 |
| Mexico | 01800 5064 800 |
| United States | (800) 829 4444 |

Asia Pacific

| | |
|-----------|----------------|
| Australia | 1 800 629 485 |
| China | 800 810 0189 |
| Hong Kong | 800 938 693 |
| India | 1 800 112 929 |
| Japan | 0120 (421) 345 |
| Korea | 080 769 0800 |
| Malaysia | 1 800 888 848 |
| Singapore | 1 800 375 8100 |
| Taiwan | 0800 047 866 |
| Thailand | 1 800 226 008 |

Europe & Middle East

| | |
|----------------|-----------------------|
| Austria | 43 (0) 1 360 277 1571 |
| Belgium | 32 (0) 2 404 93 40 |
| Denmark | 45 70 13 15 15 |
| Finland | 358 (0) 10 855 2100 |
| France | 0825 010 700* |
| | *0.125 €/minute |
| Germany | 49 (0) 7031 464 6333 |
| Ireland | 1890 924 204 |
| Israel | 972-3-9288-504/544 |
| Italy | 39 02 92 60 8484 |
| Netherlands | 31 (0) 20 547 2111 |
| Spain | 34 (91) 631 3300 |
| Sweden | 0200-88 22 55 |
| Switzerland | 0800 80 53 53 |
| United Kingdom | 44 (0) 118 9276201 |

Other European Countries:

www.agilent.com/find/contactus

Revised: July 8, 2010

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2011
Printed in USA, April 12, 2011
5990-7009EN

