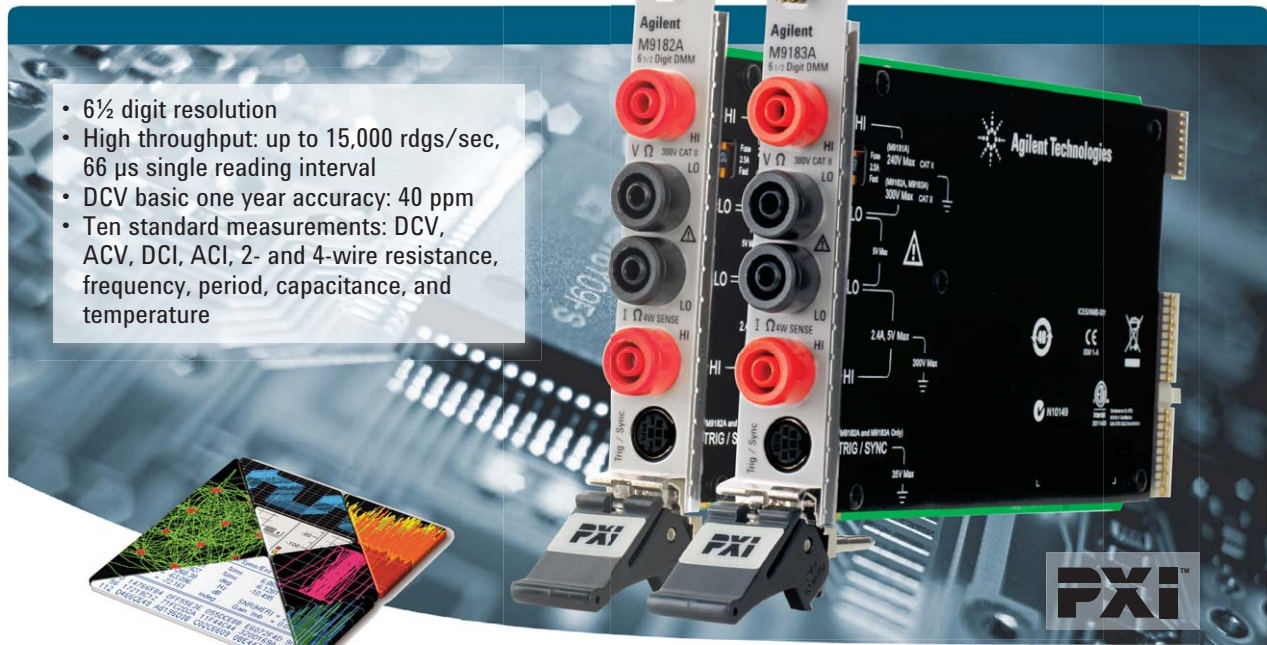


Agilent PXI Digital Multimeters



Data Sheet

6½ Digit, High Performance
M9182A
M9183A



Discover the Alternatives...

... Agilent **Modular** Products



Agilent Technologies

OVERVIEW

Agilent's M9182A and M9183A 6½ digit high performance PXI digital multimeters offer fast development, high throughput and trustworthy results. The M9182A provides ten built-in measurement types with all the accuracy and stability you would expect from an Agilent 6½ digit DMM. The M9183A provides the same capabilities as the M9182A, with market-leading measurement speed of up to 15,000 readings per second, additional ranges, and a DC source.

Industries and Applications

- Aerospace and defense
- Automotive electronics test
- Industrial electronics test
- Medical device test
- Semiconductor and component test



Features

- 6½ digit resolution
- Up to 15,000 readings per second, 66 µs single reading interval time (M9183A)
- Up to 4,500 readings per second (M9182A)
- Basic 1 year DCV accuracy of 40 ppm, 90 day accuracy of 30 ppm
- DCV, ACV, DCI, ACI, 2- and 4-wire resistance, frequency, period, capacitance, and temperature
- Pulse width, duty cycle, and totalizer/event counter (M9183A)
- DC voltage and current source (M9183A)
- External trigger in and DMM out, to synchronize with external multiplexers and instruments
- Advanced triggering
- Floating isolation (Cat II) to 300 Vrms
- Software drivers to support most common programming environments
- PXI form factor
- Chassis connector compatibility: PXI-1 (J-1 only), PXIe hybrid slot

Customer Values

- Measurements you can trust
- Higher throughput due to the lowest latency, saves test time
- Application development in the environment of your choice reduces development time
- Fast and easy installation and configuration
- Customer supportable calibration procedures as well as calibration services available from Agilent

M9182A and M9183A Feature Summary

| DMM | Description | Type # slots | Resolution | Maximum reading rate at 4½ digits | Voltage and current | Resistance, temperature, capacitance | Other measurements | DC source |
|--------|------------------------------|--------------|------------|-----------------------------------|---------------------|--|--|------------------------------|
| M9182A | High performance PXI DMM | PXI x1 | 6½ digits | 4,500 rdgs/sec | DCV, DCI, ACV, ACI | 2- and 4-wire Ω, temperature, capacitance | Frequency, period | n/a |
| M9183A | Enhanced performance PXI DMM | PXI x1 | 6½ digits | 15,000 rdgs/sec | DCV, DCI, ACV, ACI | 2- and 4-wire Ω, offset compensated ohms, temperature, capacitance | Frequency, period, pulse width and duty cycle, totalizer/event counter | ± 10 V ±(1.2 µA to 12 mA) |

EASY SETUP... TEST... AND MAINTENANCE

Hardware Platform

Compliance

The M9182A and M9183A 6½ digit digital multimeters (DMMs) are PXI compliant, using either a cPCI (J1), PXI-1 (J1) or PXIe Hybrid slot. Designed to benefit from fast data interfaces, an M9182A or M9183A DMM can be integrated with other test and automation modules in a PXI, CompactPCI, or Hybrid chassis. The PXI format offers high performance in a small, rugged package. It is an ideal deployment platform for many automated test systems. A wide array of complementary PXI products are currently available. Products from Agilent include switches, multiplexers, digitizers, waveform generators, and local oscillators.

Software Platform

IO Libraries Suite

Agilent IO Libraries Suite offers fast and easy instrument connections and now extends to modular instruments. IO Libraries Suite 16.0 adds support for PXI, helping you display all of the modules in your system, whether they are PXI, PXIe, or PCIe, as well as view information about installed software. In addition, the new version allows you to more easily find the right driver and start module soft front panels directly with Agilent Connection Expert.

National Instruments IO libraries are also supported, and may be used along with Agilent IO libraries.

Drivers

Agilent's digital multimeters come complete with software drivers for Windows® XP, Windows Vista, and Windows 7. These software drivers work in the most popular test and measurement development environments including: LabVIEW, Visual Studio® (C, C++, C#, Visual Basic) and MATLAB.

Easy software integration

Application code examples are included for LabVIEW, Visual Basic, C/C++, C#, and MATLAB – demonstrating DMM set up and basic functionality. These application code examples can be used to help you integrate the DMM module into your measurement system.

Soft front panel

The Agilent soft front panel provides easy to use instrument control. The M9182A and M9183A graphical user interface guides developers through module setup so users can quickly configure the DMM.

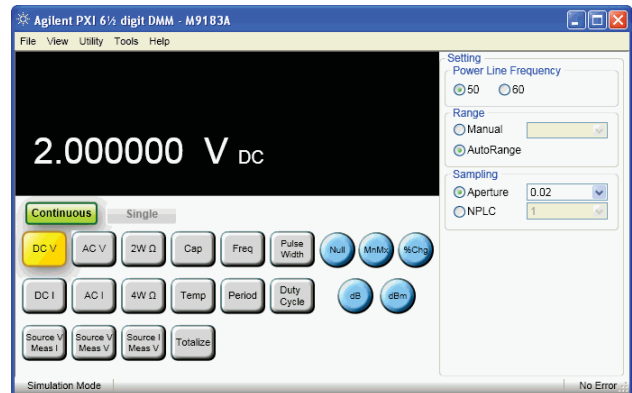


Figure 1. M9183A soft front panel

One notable feature of the soft front panel is the Driver Call Log. Available as a pull down menu item, the Driver Call Log allows the user to see the driver calls for each button pushed. The user can then incorporate the driver calls into their application program – enabling fast and easy program development.

Calibration

Each M9182A and M9183A DMM is factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate.

Calibration is required once per year. A documented calibration process allows you to do in-rack calibration using standard calibration sources. Alternatively, Agilent and 3rd party calibration labs offer calibration services for the M9182A and M9183A DMMs.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

| M9182A and M9183A: Accuracy specifications \pm (% of reading + % of range) ^{1,2} | | | | | |
|---|----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|
| Function | Range ³ | Frequency | 24 hour 23 °C \pm 1 °C | 90 day 23 °C \pm 5 °C | 1 year 23 °C \pm 5 °C |
| DC voltage | 200.0000 mV | | 0.0030 + 0.0005 | 0.0040 + 0.0008 | 0.0050 + 0.0010 |
| | 2.000000 V | | 0.0020 + 0.0002 | 0.0030 + 0.0002 | 0.0040 + 0.0003 |
| | 20.00000 V | | 0.0040 + 0.0006 | 0.0050 + 0.0007 | 0.0070 + 0.0008 |
| | 200.0000 V | | 0.0030 + 0.0002 | 0.0040 + 0.0001 | 0.0050 + 0.0003 |
| | 300.0000 V | | 0.0130 + 0.0002 | 0.0230 + 0.0003 | 0.0250 + 0.0003 |
| True RMS, AC voltage ^{4,5} (Fast RMS off) | 200.0000 mV ⁶ | 10 Hz - 20 Hz | 3.00 + 0.18 | 3.10 + 0.19 | 3.20 + 0.22 |
| | | 20 Hz - 47 Hz | 0.37 + 0.08 | 0.38 + 0.09 | 0.40 + 0.10 |
| | | 47 Hz - 10 kHz | 0.13 + 0.05 | 0.14 + 0.06 | 0.15 + 0.06 |
| | | 10 kHz - 50 kHz | 0.25 + 0.08 | 0.26 + 0.10 | 0.27 + 0.12 |
| | | 50 kHz - 100 kHz | 1.90 + 0.18 | 1.95 + 0.19 | 2.00 + 0.20 |
| | 2.000000 V | 10 Hz - 20 Hz | 3.00 + 0.10 | 3.10 + 0.11 | 3.20 + 0.13 |
| | | 20 Hz - 47 Hz | 0.37 + 0.07 | 0.38 + 0.08 | 0.40 + 0.09 |
| | | 47 Hz - 10 kHz | 0.05 + 0.05 | 0.06 + 0.06 | 0.07 + 0.06 |
| | | 10 kHz - 50 kHz | 0.32 + 0.06 | 0.33 + 0.66 | 0.35 + 0.08 |
| | | 50 kHz - 100 kHz | 1.90 + 0.08 | 2.00 + 0.09 | 2.10 + 0.10 |
| | 20.00000 V | 10 Hz - 20 Hz | 3.00 + 0.07 | 3.10 + 0.08 | 3.30 + 0.10 |
| | | 20 Hz - 47 Hz | 0.37 + 0.06 | 0.38 + 0.07 | 0.40 + 0.08 |
| | | 47 Hz - 10 kHz | 0.06 + 0.05 | 0.07 + 0.06 | 0.07 + 0.07 |
| | | 10 kHz - 50 kHz | 0.18 + 0.09 | 0.20 + 0.11 | 0.22 + 0.13 |
| | | 50 kHz - 100 kHz | 1.30 + 0.15 | 1.40 + 0.18 | 1.50 + 0.20 |
| | 200.0000 V & 300.0000 V | 10 Hz - 20 Hz | 3.00 + 0.07 | 3.10 + 0.08 | 3.30 + 0.08 |
| | | 20 Hz - 47 Hz | 0.43 + 0.06 | 0.44 + 0.07 | 0.45 + 0.08 |
| | | 47 Hz - 10 kHz | 0.07 + 0.05 | 0.08 + 0.07 | 0.09 + 0.08 |
| | | 10 kHz - 50 kHz | 0.28 + 0.07 | 0.30 + 0.08 | 0.32 + 0.10 |
| | | 50 kHz - 100 kHz | 1.30 + 0.09 | 1.60 + 0.12 | 2.40 + 0.13 |
| True RMS, AC voltage ^{4,5} (Fast RMS on) | 200.0000 mV ⁶ | 350 Hz - 800 Hz | 0.60 + 0.08 | 0.65 + 0.09 | 0.70 + 0.10 |
| | | 800 Hz - 10 kHz | 0.13 + 0.05 | 0.14 + 0.06 | 0.15 + 0.06 |
| | | 10 kHz - 50 kHz | 0.55 + 0.08 | 0.60 + 0.10 | 0.63 + 0.12 |
| | | 50 kHz - 100 kHz | 5.30 + 0.18 | 5.40 + 0.19 | 5.60 + 0.20 |
| | | 2.000000 V | 350 Hz - 800 Hz | 0.93 + 0.07 | 0.96 + 0.08 |
| | 800 Hz - 10 kHz | | 0.07 + 0.05 | 0.08 + 0.06 | 0.08 + 0.06 |
| | 10 kHz - 50 kHz | | 0.62 + 0.06 | 0.65 + 0.66 | 0.70 + 0.08 |
| | 50 kHz - 100 kHz | | 5.10 + 0.08 | 5.20 + 0.09 | 5.30 + 0.10 |
| | 20.00000 V | | 350 Hz - 800 Hz | 0.93 + 0.06 | 0.96 + 0.07 |
| | | 800 Hz - 10 kHz | 0.07 + 0.05 | 0.07 + 0.06 | 0.07 + 0.07 |
| | | 10 kHz - 50 kHz | 0.31 + 0.09 | 0.33 + 0.11 | 0.35 + 0.13 |
| | | 50 kHz - 100 kHz | 2.00 + 0.15 | 2.20 + 0.18 | 2.40 + 0.20 |
| | | 200.0000 V & 300.0000 V | 350 Hz - 800 Hz | 1.00 + 0.06 | 1.10 + 0.07 |
| | 800 Hz - 10 kHz | | 0.07 + 0.05 | 0.07 + 0.07 | 0.08 + 0.08 |
| | 10 kHz - 50 kHz | | 0.34 + 0.07 | 0.45 + 0.08 | 0.50 + 0.10 |
| | 50 kHz - 100 kHz | | 2.50 + 0.09 | 2.80 + 0.12 | 3.20 + 0.13 |

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

| M9182A and M9183A: Accuracy specifications \pm (% of reading + % of range) ^{1,2} | | | | | |
|---|--|---|-----------------------------|----------------------------|----------------------------|
| Function | Range ³ | Frequency, test current or burden voltage | 24 hour 23 °C \pm 1 °C | 90 day 23 °C \pm 5 °C | 1 year 23 °C \pm 5 °C |
| Resistance ⁷ | 20.00000 Ω (M9183A only) | 10 mA | 0.004 + 0.004 | 0.009 + 0.004 | 0.014 + 0.005 |
| | 200.0000 Ω | 1 mA | 0.004 + 0.002 | 0.010 + 0.002 | 0.013 + 0.003 |
| | 2.000000 k Ω | 1 mA | 0.003 + 0.002 | 0.008 + 0.002 | 0.012 + 0.002 |
| | 20.00000 k Ω | 100 μ A | 0.003 + 0.002 | 0.008 + 0.002 | 0.012 + 0.002 |
| | 200.0000 k Ω | 10 μ A | 0.006 + 0.002 | 0.010 + 0.002 | 0.016 + 0.003 |
| | 2.000000 M Ω | 1 μ A | 0.018 + 0.002 | 0.030 + 0.003 | 0.040 + 0.004 |
| | 20.00000 M Ω | 100 nA | 0.120 + 0.002 | 0.130 + 0.003 | 0.200 + 0.003 |
| | 200.0000 M Ω (M9183A, 2-wire only) | 4 nA | 0.800 + 0.013 | 1.000 + 0.015 | 1.300 + 0.025 |
| DC current | 200.0000 nA (M9183A only) | < 100 μ V | 0.130 + 0.020 | 0.160 + 0.023 | 0.170 + 0.030 |
| | 2.000000 μ A (M9183A only) | < 100 μ V | 0.050 + 0.004 | 0.080 + 0.003 | 0.210 + 0.008 |
| | 20.00000 μ A (M9183A only) | < 100 μ V | 0.050 + 0.002 | 0.080 + 0.003 | 0.130 + 0.004 |
| | 200.0000 μ A (M9183A only) | < 2.5 mV | 0.052 + 0.100 | 0.070 + 0.150 | 0.100 + 0.200 |
| | 2.000000 mA | < 25 mV | 0.020 + 0.015 | 0.030 + 0.020 | 0.040 + 0.028 |
| | 20.00000 mA | < 250 mV | 0.020 + 0.002 | 0.035 + 0.003 | 0.045 + 0.003 |
| | 200.0000 mA | < 55 mV | 0.020 + 0.025 | 0.030 + 0.030 | 0.040 + 0.040 |
| | 2.000000 A | < 520 mV | 0.100 + 0.003 | 0.150 + 0.004 | 0.200 + 0.005 |
| True RMS, AC current ⁸ | 2.000000 mA ⁹ | 10 Hz - 20 Hz | 2.70 + 0.20 | 2.90 + 0.20 | 2.90 + 0.20 |
| | | 20 Hz - 47 Hz | 0.90 + 0.20 | 0.90 + 0.20 | 1.00 + 0.20 |
| | | 47 Hz - 1 kHz | 0.04 + 0.08 | 0.08 + 0.15 | 0.12 + 0.20 |
| | | 1 kHz - 10 kHz | 0.12 + 0.20 | 0.14 + 0.20 | 0.22 + 0.20 |
| | 20.00000 mA | 10 Hz - 20 Hz | 1.80 + 0.15 | 2.60 + 0.15 | 2.80 + 0.15 |
| | | 20 Hz - 47 Hz | 0.60 + 0.15 | 0.90 + 0.15 | 1.00 + 0.15 |
| | | 47 Hz - 1 kHz | 0.07 + 0.05 | 0.15 + 0.10 | 0.16 + 0.15 |
| | | 1 kHz - 10 kHz | 0.21 + 0.15 | 0.30 + 0.20 | 0.40 + 0.20 |
| | 200.0000 mA | 10 Hz - 20 Hz | 1.80 + 0.20 | 2.70 + 0.20 | 2.80 + 0.20 |
| | | 20 Hz - 47 Hz | 0.60 + 0.20 | 0.90 + 0.20 | 1.00 + 0.20 |
| | | 47 Hz - 1 kHz | 0.15 + 0.08 | 0.17 + 0.09 | 0.20 + 0.11 |
| | | 1 kHz - 10 kHz | 0.30 + 0.15 | 0.35 + 0.18 | 0.40 + 0.20 |
| | 2.000000 A | 10 Hz - 20 Hz | 1.80 + 0.20 | 2.50 + 0.23 | 2.70 + 0.25 |
| | | 20 Hz - 47 Hz | 0.66 + 0.30 | 0.80 + 0.30 | 0.90 + 0.30 |
| | | 47 Hz - 1 kHz | 0.30 + 0.19 | 0.33 + 0.19 | 0.35 + 0.20 |
| | | 1 kHz - 10 kHz | 0.40 + 0.20 | 0.45 + 0.23 | 0.50 + 0.25 |
| Frequency or period ^{10, 14} | 200 mV to 300 V | 1 Hz - 20 Hz | 0.075 + 0.003 | 0.075 + 0.003 | 0.075 + 0.003 |
| | | 20 Hz - 130 Hz | 0.025 + 0.002 | 0.025 + 0.002 | 0.025 + 0.002 |
| | | 130 Hz - 640 Hz | 0.025 + 0.003 | 0.025 + 0.003 | 0.025 + 0.003 |
| | | 640 Hz - 2.5 kHz | 0.030 + 0.003 | 0.030 + 0.003 | 0.030 + 0.003 |
| | | 2.5 kHz - 40 kHz | 0.030 + 0.003 | 0.030 + 0.003 | 0.030 + 0.003 |
| | | 40 kHz - 200 kHz | 0.050 + 0.004 | 0.050 + 0.004 | 0.050 + 0.004 |
| | | 200 kHz - 300 kHz | 0.070 + 0.002 | 0.070 + 0.002 | 0.070 + 0.002 |

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

| M9182A and M9183A: Accuracy specifications \pm (% of reading + % of range) ^{1,2} | | | | | |
|---|----------------------|----------------------------------|-----------------------------|----------------------------|----------------------------|
| Function | Range | Full scale reading or resolution | 24 hour 23 °C \pm 1 °C | 90 day 23 °C \pm 5 °C | 1 year 23 °C \pm 5 °C |
| Single shot duty cycle ¹¹ [M9183A only] | 2 - 100 Hz | 0.02 % | 0.03 \pm 0.03 | 0.03 \pm 0.03 | 0.03 \pm 0.03 |
| | 100 Hz - 1 kHz | 0.20 % | 0.03 \pm 0.30 | 0.03 \pm 0.30 | 0.03 \pm 0.30 |
| | 1 - 10 kHz | 2.00 % | 0.03 \pm 3.00 | 0.03 \pm 3.00 | 0.03 \pm 3.00 |
| Single shot pulse width ^{12, 14} [M9183A only] | 14 μ s - 62.5 ms | 1 μ s | .01 \pm 4 μ s | 01 \pm 4 μ s | 01 \pm 4 μ s |
| Capacitance ¹³ [M9183A and M9182A] | 1000.0 pF | 1199.9 pF | 1.00 + 0.10 | 1.00 + 0.10 | 1.00 + 0.10 |
| | 10.000 nF | 11.999 nF | 1.20 + 0.05 | 1.20 + 0.05 | 1.20 + 0.05 |
| | 100.00 nF | 119.99 nF | 1.00 + 0.10 | 1.00 + 0.10 | 1.00 + 0.10 |
| | 1.0000 μ F | 1.1999 μ F | 1.00 + 0.10 | 1.00 + 0.10 | 1.00 + 0.10 |
| | 10.000 μ F | 11.999 μ F | 1.00 + 0.10 | 1.00 + 0.10 | 1.00 + 0.10 |
| | 100.00 μ F | 119.99 μ F | 1.00 + 0.10 | 1.00 + 0.10 | 1.00 + 0.10 |
| | 1.0000 mF | 1.1999 mF | 1.20 + 0.10 | 1.20 + 0.10 | 1.20 + 0.10 |
| | 10.000 mF | 11.999 mF | 2.00 + 0.10 | 2.00 + 0.10 | 2.00 + 0.10 |

1. Specifications are for 1 hour warm up, within 1 hour self-cal, aperture \geq 0.5 sec, slow AC filter.
2. For temperatures outside the range of 23 °C \pm 5 °C, but within 0 °C to 50 °C, add 0.1 \times accuracy specification per °C.
3. 20% over range on all ranges except 300 V range, 10% over range for 300 V range.
4. Minimum input specified: 5 mV or 1% of range, whichever is larger.
5. Signal is limited to 8×10^6 Volt Hz product. For example, at 32 kHz, the highest input is 250 V.
6. For inputs from 5 mV to 10 mV, add 100 μ V to the specification.
7. Specifications are for 4-wire resistance measurements, for 2-wire, add 1 m Ω additional error to the specification.
8. Minimum input specified: 60 μ A or 1.5% of range, whichever is larger.
9. For inputs from 60 to 120 μ A, add 10 μ A to the specification.
10. Minimum amplitude greater of: 100 mV, or 5 % of range for 1 Hz to 2.5 kHz, or 25 % of range for 2.5 kHz to 300 kHz.
11. Specifications are % of reading (0.03) \pm adder.
12. Specifications are % of reading + time.
13. Specifications apply to input signals \geq 5% of range.
14. Maximum wait time for duty cycle and period is 5 seconds.

Definitions for specifications

Specification (spec): Represents warranted performance of a calibrated instrument that has been stored for a minimum of two hours within the operating temperature range of 0 to 55 °C, unless otherwise stated, and after a one hour warm-up period. The specifications include measurement uncertainty. Data represented in this document are specifications unless otherwise noted.

Typical (typ): Represents characteristic performance, which 80% of the instruments manufactured will meet. This data is not warranted, does not include measurement uncertainty, and is valid only at room temperature (approximately 25 °C).

Nominal (nom): The expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is not warranted and is measured at room temperature (approximately 25 °C).

Measured (meas): An attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is not warranted and is measured at room temperature (approximately 25 °C).

Note: All graphs contain measured data from several units at room temperature unless otherwise noted.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

| M9182A and M9183A Sensitivity (nom) | | |
|-------------------------------------|-------------------|-----------------|
| Function | Lowest Range | Sensitivity |
| DCV | 200.0000 mV | 0.1 μ V |
| ACV | 200.0000 mV | 0.1 μ V |
| Resistance (M9183A) | 20.00000 Ω | 10 $\mu\Omega$ |
| Resistance (M9182A) | 200.0000 Ω | 100 $\mu\Omega$ |
| DCI (M9183A) | 200.0000 nA | 0.1 pA |
| DCI (M9182A) | 2.000000 mA | 10 nA |
| ACI | 2.000000 mA | 1 nA |
| Capacitance | 1000.0 pF | 0.1 pF |

| M9182A and M9183A temperature accuracy (spec) ¹ | | | | | |
|--|-----------------|-----------------------------|-------------|-----------------------|--|
| Temperature function | Type | R ₀ (Ω) | Sensitivity | Range/max temperature | 1 year 23 °C \pm 5 °C |
| RTD temperature measurement ^{2,3} | pt385 | 100 Ω , 200 Ω | 0.01 °C | -150 to 650 °C | \pm 0.06 °C |
| | | 500 Ω , 1 k Ω | 0.01 °C | -150 to 650 °C | \pm 0.03 °C |
| | Cu (Copper) | Less than 12 Ω | 0.01 °C | -100 to 200 °C | \pm 0.18 °C at \leq 20 °C \pm 0.05 °C otherwise |
| | | Higher than 90 Ω | 0.01 °C | -100 to 200 °C | \pm 0.10 °C at \leq 20 °C \pm 0.05 °C otherwise |
| Thermocouple temperature measurement ^{4,5} | B | NA | 0.01 °C | 2200 °C | \pm 0.38 °C |
| | E | NA | 0.01 °C | 1200 °C | \pm 0.035 °C |
| | J | NA | 0.01 °C | 2000 °C | \pm 0.06 °C |
| | K | NA | 0.01 °C | 3000 °C | \pm 0.07 °C |
| | N | NA | 0.01 °C | 3000 °C | \pm 0.10 °C |
| | R | NA | 0.01 °C | 2700 °C | \pm 0.25 °C |
| | S | NA | 0.01 °C | 3500 °C | \pm 0.35 °C |
| | T | NA | 0.01 °C | 550 °C | \pm 0.06 °C |
| Thermistor ³ | 2.25 k Ω | NA | 0.01 °C | -80 to 150 °C | \pm 0.1 °C |
| | 5 k Ω | NA | 0.01 °C | -80 to 150 °C | \pm 0.1 °C |
| | 10 k Ω | NA | 0.01 °C | -80 to 150 °C | \pm 0.1 °C |

1. Specifications are for one hour warm up, within one hour self-cal, aperture \geq 0.5 sec, slow AC filter.

2. 4-wire RTD measurement, R₀ variable 1 Ω to 7 k Ω .

3. For total measurement accuracy, add temperature probe error.

4. For total measurement accuracy, add thermocouple error and cold junction compensation.

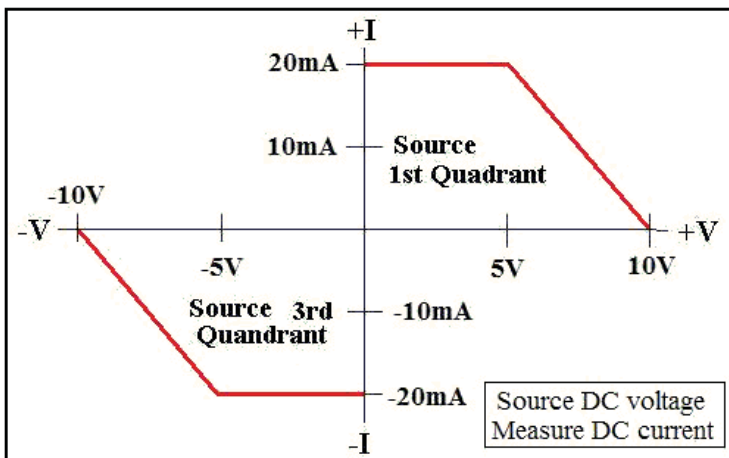
5. DMM linearization temperature range may be greater than that of the thermocouple device.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

Source-Measure [(spec) unless otherwise stated)]

| M9183A source DC voltage, measure DC voltage | | |
|--|----------------------|----------------------|
| Parameter | Extended resolution | Basic resolution |
| DC voltage source (output) range | -10.000 to +10.000 V | -10.000 to +10.000 V |
| DC current source/sink at 5 V output | 5 mA | 5 mA |
| DAC resolution (nom) | 18 bits | 12 bits |
| DC voltage source accuracy 1 year, (23 °C ± 5 °C) ^{1,2,3} | 0.015% ± 0.004% | 1.0% ± 0.4% |
| Settling time (typ) | 100 ms | 1 ms |
| Source resistance (nom) | 200 Ω | 200 Ω |

| M9183A source DC voltage, measure DC current | |
|---|----------------------|
| DC voltage source (output) range | -10.000 to +10.000 V |
| DC current measurement range | 0 to ± 20 mA |
| Voltage resolution (nom) | 5 mV |
| Voltage source accuracy 1 Year, (23 °C ± 5 °C) ^{1,2,3} | 1.0% ± 0.35% |
| Settling time (typ) | 100 ms |
| DC current measurement accuracy | 0.1% + 0.005% |



| M9183A source DC current, measure DC voltage | | | |
|--|--------------------|---------------|---|
| DC voltage measurement range | 0 to ± 2.0 V | | |
| Current output | Compliance voltage | Minimum Level | Source Accuracy 1 year, (23 °C ± 5 °C) ^{1,2,3} |
| < 1.25 μA | 4.2 V | 10 nA | 1% + 1% |
| < 12.5 μA | 4.2 V | 50 nA | 1% + 1% |
| < 125 μA | 4.2 V | 100 nA | 1% + 0.5% |
| < 1.25 mA | 4.2 V | 1 μA | 1% + 0.5% |
| < 12.5 mA | 1.2 V | 10 μA | 1% + 0.5% |

1. Specifications are for one hour warm up, within one hour self-cal, slow AC filter.
2. For temperatures outside the range of 23 °C ± 5 °C, but within 0 °C to 50 °C, add 0.1 × accuracy specification per °C.
3. Repetitive reading at an aperture of 133 ms or higher.

TECHNICAL SPECIFICATIONS AND CHARACTERISTICS

Triggering Characteristics

The M9182A and M9183A have advanced triggering capabilities that exceed those found on other digital multimeters. Advanced triggering enables you to obtain the signal you need and accurately measure it, in a variety of applications.

External hardware trigger

| | |
|--|--------------------------------------|
| Trigger input voltage level range (at DIN 7 connector) | +3 to +15 V activates the trigger |
| Minimum trigger pulse width | Aperture + 50 μ s |
| Trigger input impedance | 3 k Ω |
| Edge | Selectable positive or negative edge |

PXI bus trigger inputs

| | |
|---|--------------------------------------|
| Trigger input voltage level range (via PXI backplane) | CMOS level (see PXI standard) |
| Minimum trigger pulse width | Aperture + 50 μ s |
| Edge | Selectable positive or negative edge |

Trigger features

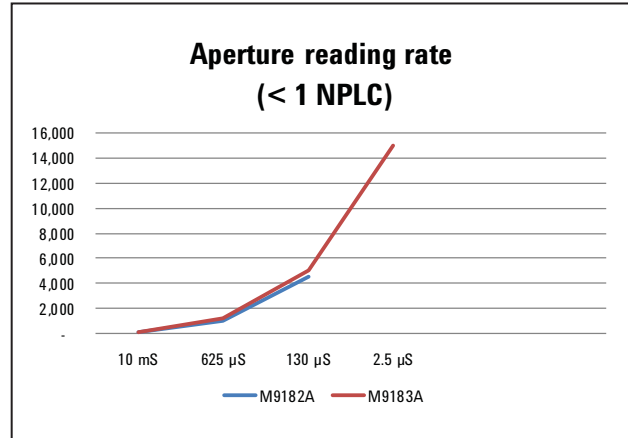
| | | |
|---|-----------------------------|--|
| Trigger sources | | Immediate, PXI trigger , external DIN connector, analog threshold trigger source |
| Trigger delay [Auto delay (default delay) ensures 1st reading accuracy in most configurations) | Measurement delay | 50 μ s to 15 s |
| | Resolution | 1 μ s to 65 ms and 16 μ s above 65 ms |
| Reading storage | | Circular buffer - 80 readings |
| Multi Sample Mode (DCV and DCI functions only) | Aperture range | 2.5 μ s to 160 ms (M9183A) 130 μ s to 160 ms (M9182A) |
| | Maximum read interval range | 1sec for apertures \geq 625 μ s, else 65 ms |
| | Reading per trigger | Up to 80 readings (pre- or post-trigger) |
| | Trigger sources | PXI trigger, external DIN connector, and analog threshold |

MEASUREMENT CHARACTERISTICS

Resolution vs. Aperture and Reading Rate for DCV, DCI, Ω

| Measurement aperture | Maximum readings per second | Resolution |
|----------------------|--------------------------------------|---------------------|
| 10 ms | 98 | 6½ digits (22 bits) |
| 625 μ s | 1,200 | 5½ digits (18 bits) |
| 130 μ s | 4,500 | 4½ digits (14 bits) |
| 2.5 μ s | 15,000 (M9183A only) ¹ | 4½ digits (14 bits) |

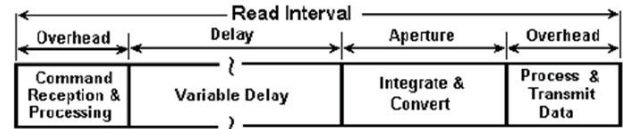
1. 15,000 readings/second represent a typical maximum with a measurement aperture of 2.5 μ s. Results will vary, depending on what PC hardware, PXI hardware, and driver are used.



Transaction Speed

Transactional I/O speed is a single reading measurement. This is important when you are taking many single measurements with the DMM. The M9183A delivers the highest transactional measurement speed in its class. These fast readings, up to 15,000 readings per second with a read interval rate of 66 μ s, provides the lowest latency, translating into higher test-system throughput and lower cost of test per unit tested.

Variable delay can be programmed to allow fully settled readings in most configurations.



Time frame of a single measurement
Minimum read interval = 66 μ s (M9183A only)

System Reading and Throughput Rates

| Switching ranges within a function | Aperture (A) | Range change time (ms) |
|--|----------------|--------------------------|
| DCV | $A \leq 20$ ms | $(A \times 0.2) + 15$ |
| | $A > 20$ ms | $A + 15.6$ |
| Resistance (2-wire or 4-wire) | $A < 33$ ms | $(A \times 0.05) + 15.5$ |
| | $A \geq 33$ ms | $A + 13$ |
| DCI (200 mA or 2 A to any other range) | $A \leq 40$ ms | 4.2 |
| | $A > 40$ ms | 15.7 |
| DCI (all other ranges) | All apertures | 1 |
| Capacitance | All apertures | 12 |

| Switch between functions | Aperture (A) | Function change time (ms) |
|---------------------------|-----------------------------|---------------------------|
| DCV | $A < 16$ ms | 15.6 |
| | $A \geq 16$ ms | $A + 25$ |
| Resistance to DCI | $A < 16.66$ ms | 7.8 |
| | 16.66 ms $\leq A < 40$ ms | $A \times 0.65$ |
| | $A \geq 66.66$ ms | $(A \times 0.51) + 45$ |
| DCV to capacitance | $A < 33.33$ ms | 23.4 |
| | $A \geq 33.33$ ms | $(A \times 0.65) + 50$ |
| Resistance to capacitance | $A \leq 33.33$ ms | 23.4 |
| | 33.33 ms $< A < 80$ ms | $(A \times 2) + 35$ |
| | 80 ms $\leq A < 160$ ms | 23.4 |
| | $A \geq 160$ ms | 160 |

MEASUREMENT CHARACTERISTICS

| DC voltage | |
|-----------------------------------|--|
| Measurement method | Delta-sigma A/D conversion |
| Input resistance | 200 mV, 2.0 V ranges: >10 G Ω with typical leakage of < 50 pA; 20 V, 200 V, 300 V ranges: 10.0 M Ω |
| Input isolation | 330 VDC, 250 VAC from Earth ground |
| Input overvoltage protection | 330 VDC all ranges |
| DCV noise rejection | Normal mode rejection at 50, 60, or 400 Hz \pm 0.5%; > 95 dB (apertures \geq 0.160 s); CMRR (1 k Ω lead imbalance) \geq 120 dB |
| True RMS AC voltage | |
| Measurement method | AC coupled (10 Hz to 100 kHz) true RMS — measures the AC component of an input waveform that consists of AC and DC components. |
| Crest factor | Maximum crest factor of 4 at full scale, 7 at 10% of range |
| Input impedance | 1 M Ω , in parallel with < 300 pF |
| Settling time | < 0.5 sec to within 0.1% of final value Fast RMS: < 0.05 sec to within 0.1% of final value |
| Peak input | 8 x 10 ⁶ volt Hz product (example: 250 V @ 32 kHz) |
| Input overvoltage protection | 330 VAC all ranges |
| ACV noise rejection | Common mode rejection at 50 Hz or 60 Hz; 1 k Ω imbalance in either lead > 60 dB |
| Resistance | |
| Measurement method | Selectable 2-wire or 4-wire. Current source referenced to LO output |
| Offset compensation (M9183A only) | All ranges, use with apertures > 5 ms |
| Maximum test voltage | 240 mV for 20 Ω and 200 Ω ranges; 2.4 V for 20 k Ω to 20 M Ω ranges; 1.0 V for 200 M Ω range (M9183A only) |
| Maximum lead resistance (4-wire) | 50 k Ω for 200 k Ω , 2.0 M Ω , and 20 M Ω ranges; 5 k Ω for 20 k Ω range 500 Ω for 200 Ω and 2 k Ω ranges; 50 Ω for 20 Ω range |
| Input protection | 330 V on all ranges |
| DC current | |
| Shunt resistance | 10 Ω for 2 mA and 20 mA, 0.1 Ω for 200 mA and 2 A; Virtual zero shunt for 200 μ A, 20 μ A, 2 μ A, and 200 nA range (M9183A only) |
| Input protection | Protected with 2.5 A, 250 V fast blow fuse |
| True RMS AC current | |
| Measurement method | AC coupled true RMS measurement (measures the AC component only.) analog RMS DC converter. |
| Shunt resistance | 10 Ω for 2 mA and 20 mA, 0.1 Ω for 200 mA and 2 A |
| Input protection | Protected with 2.5 A, 250 V fast blow fuse |

MEASUREMENT CHARACTERISTICS

| Frequency and period | |
|----------------------|--------------------------------|
| Measurement method | Direct (conventional) counting |
| Input impedance | 1 M Ω with < 300 pF |
| Sensitivity (130 Hz) | .001 Hz |

| Totalizer (M9183A only) | |
|-------------------------|---------------------------------|
| Active edge polarity | Positive or negative transition |
| Maximum count | 10,000,000,000 |
| Allowed rate | 1 to 30,000 events per second |
| Threshold | Set threshold DAC |
| Accuracy | ± 2 counts |

| Capacitance | |
|--------------------|--|
| Measurement method | Differential charge balance: variable currents used to stimulate dV/dt response. |
| Connection type | 2-wire |

| Environmental and physical characteristics | |
|--|---|
| Temperature range | Operating -10° to 55 °C Non-operating -40 ° to +85 °C |
| Relative humidity | Operating to 80% at 40 °C Storage to 95% at 40 °C |
| Connectors | V HI, 2-wire Ω IN, DCV OUT Sheathed banana jack V LO, 2-wire Ω IN, DCV OUT Sheathed banana jack I HI, 4-wire Ω IN Sheathed banana jack I LO, 4-wire Ω IN Sheathed banana jack Sync OUT DIN 7, pin 2 External Trigger IN DIN 7, pin 7 Trigger and Sync common DIN 7, pin 4 |
| Safety | Complies with IEC 61010-1, Cat II 300 V, pollution degree 2 |
| EMC | Complies with EN61326-1 Industrial Environment |
| Warm-up time | 1 hour |

| Physical characteristics | |
|--------------------------|-----------------------------------|
| Dimensions | 3U/1-slot PXI/CompactPCI standard |
| Weight | 0.5 kg (1 lb.) |

| Power dissipation: | |
|--------------------|-------------|
| +5 V | Total power |
| 300 mA | 1.5 W max |

CONFIGURATION

Hardware ¹

| Model | Description |
|--------------------|--|
| M9182A | PXI 6½ digit multimeter |
| M9183A | PXI 6½ digit multimeter, enhanced performance |
| DMM units include: | Getting started guide, software drivers, user and service documentation (on CD ROM), Agilent I/O libraries |

1. The M9182A and M9183A are intended for use in a PXI chassis.

Software

| Model | Description |
|--|---|
| Supported Operating Systems | Microsoft Windows XP (32-bit), Microsoft Windows Vista (32/64-bit), Microsoft Windows 7 (32/64-bit) |
| Standard Compliant Drivers | IVI-C, IVI-COM, LabVIEW |
| Supported Application Development Environments (ADE) | VisualStudio (VB.NET, C#, C/C++), LabVIEW |
| Agilent IO Libraries | Includes: VISA Libraries, Agilent Connection Expert, IO Monitor |

Calibration and Warranty

Advantage services: calibration and warranty

Agilent Advantage Services is committed to your success throughout your equipment's lifetime.

Calibration

| | |
|-------------|---------------------------------|
| R-50C-011-3 | Yearly calibration, for 3 years |
| R-50C-011-5 | Yearly calibration, for 5 years |

Warranty

Standard warranty is 1 year

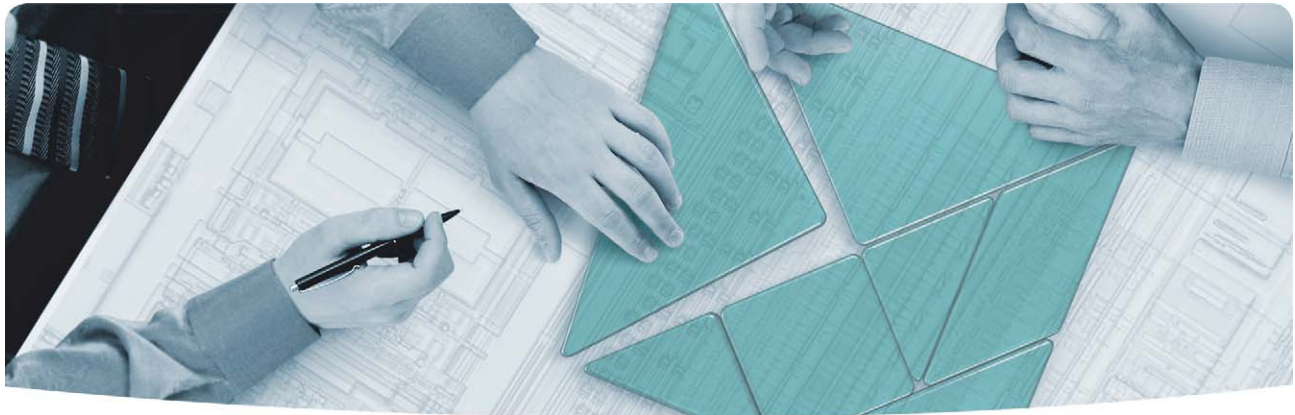
| | |
|--------------|---|
| R-51B-001-3C | 1 year return-to-Agilent warranty extended to 3 years |
| R-51B-001-5C | 1 year return-to-Agilent warranty extended to 5 years |

Accessories

| Model | Description |
|--------|---------------|
| 34138A | Test lead set |

Related products

| Model | Description |
|--------|---|
| M9018A | 18-slot PXIe chassis |
| M9021A | PXIe system interface |
| M9121A | PXI high-density matrix switch |
| M9131A | PXI SPDT switch, 64 channel |
| M9101A | PXI high-density multiplexer, 64 channels |



The Modular Tangram

The four-sided geometric symbol that appears throughout this document is called a tangram. This seven-piece puzzle originated in China a few centuries ago. The goal is to create shapes—from simple to complex—that form an identifiable silhouette. As with a tangram, the possibilities may seem infinite as you begin to create a new test system. With a set of clearly defined elements—architecture, hardware, software—Agilent can help you create the system you need, from simple to complex.



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Revised: July 17, 2010



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