Keysight Technologies
6½ Digit PXI Digital Multimeters (M9181A, M9182A, M9183A)

Data Sheet

- 6½ digit resolution
- High throughput: up to 15,000 rdgs/sec, 66 µs single reading interval
- DCV basic one year accuracy: up to 40 ppm
- DCV, ACV, DCI, ACI, 2- and 4-wire resistance measurements
- Various DMM measurement types and DC source function on higher-end models

KEYSIGHT TECHNOLOGIES

Overview

The Keysight Technologies, Inc. M9181A PXI digital multimeter provides the most popular measurement functions, including DCV, ACV, DCI, ACI, 2- and 4-wire resistance, at an affordable price. Keysight's M9182A and M9183A 6½ digit high performance PXI digital multimeters (DMMs) offer fast throughput, flexible measurements, and trustworthy results. The M9182A provides ten built-in measurement types with all the accuracy and stability you would expect from 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

Customer Values

- M9181A provides a low cost solution with the most common DMM measurements
- Measurements you can trust
- Higher test throughput due to the lowest latency
- Application development in the environment of your choice reduces development time
- Customer supportable calibration procedures as well as calibration services available from Keysight

PXI-DMM M918xA Feature Summary

All three products are 6½ digit PXI DMMs that take DCV, ACV, DCI, ACI, 2- and 4-wire resistance measurements.

DMM	Description	DCV basic 1 year accuracy	Maximum reading rate at 4½ digits	Other measurements	Triggering	DC source	Floating isolation	Connector compatibility
M9181A	Basic features PXI DMM	90 ppm	150 rdgs/sec, 6.7 ms single reading interval time	None	Immediate	n/a	CAT II 240 V	PXI-1 (J-1 only)
M9182A	High performance PXI DMM	40 ppm	4,500 rdgs/sec, 222 µs single reading interval time	Temperature, capacitance, frequency, period	Immediate, analog threshold, PXI trigger bus, external	n/a	CAT II 300 V	PXI-1 (J-1 only), PXIe hybrid slot
M9183A	Enhanced performance PXI DMM	40 ppm	15,000 rdgs/sec, 66 µs single reading interval time	Temperature, capacitance, frequency, period, offset compensated Ω, pulse width, duty cycle, totalizer/event counter	Immediate, analog threshold, PXI trigger bus, external	± 10 V ± (1.2 µA to 12 mA)	CAT II 300 V	PXI-1 (J-1 only), PXIe hybrid slot

Easy Setup... Test... and Maintenance

Hardware Platform

Compliance

The M9181A, M9182A and M9183A 6½ digit DMMs are PXI compliant, using either a cPCI (J1) or PXI-1 (J1) slot. Additionally, the M9182A and M9183A are also compatible with the PXIe Hybrid slot. Designed to benefit from fast data interfaces, these PXI DMMs 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 Keysight include switches, multiplexers, digitizers, waveform generators, and local oscillators.

Software Platform

IO Libraries Suite

Keysight IO Libraries Suite offers fast and easy instrument connections. IO Libraries Suite 16.1 supports PXI, helping you display all of the modules in your system, view information about installed software and allows you to more easily find the right driver and start module soft front panels directly with Keysight Connection Expert.

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

Drivers

Keysight's digital multimeters come complete with software drivers for Windows XP, Windows Vista, and Windows 7 (32 and 64 bit). These software drivers work in the most popular test and measurement development environments including: LabVIEW, Visual Studio (C, C++, C#, Visual Basic), MATLAB, and VEE.

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

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

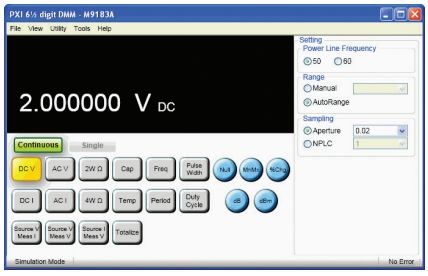


Figure 1. M9183A soft front panel

Calibration

Each M9181A, 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, Keysight and 3rd party calibration labs offer calibration services for the PXI DMMs.

M9181A Technical Specifications and Characteristics

M9181A: Accuracy specifications ±(% of reading + % of range)[1,2,3]			
Function	Range	Frequency, test current or burden voltage	1 year 23 °C ± 5 °C
DC voltage	200.0000 mV		0.0100 + 0.0018
	2.000000 V		0.0090 + 0.0005
	20.00000 V		0.0120 + 0.0015
	200.0000 V		0.0100 + 0.0005
True RMS, AC voltage[4,5]	200.0000 mV	10 Hz - 20 Hz	3.60 + 0.35
		20 Hz - 47 Hz	0.50 + 0.35
		47 Hz - 10 kHz	0.16 + 0.35
		10 kHz - 50 kHz	0.40 + 0.35
		50 kHz - 100 kHz	2.20 + 0.50
	2.000000 V	10 Hz - 20 Hz	3.50 + 0.13
		20 Hz - 47 Hz	0.50 + 0.09
		47 Hz - 10 kHz	0.08 + 0.06
		10 kHz - 50 kHz	0.40 + 0.13
		50 kHz - 100 kHz	2.20 + 0.25
	20.00000 V	10 Hz - 20 Hz	4.50 + 0.18
		20 Hz - 47 Hz	0.65 + 0.15
		47 Hz - 10 kHz	0.09 + 0.12
		10 kHz - 50 kHz	0.30 + 0.18
		50 kHz - 100 kHz	1.70 + 0.25
	200.0000 V	10 Hz - 20 Hz	3.30 + 0.20
		20 Hz - 47 Hz	0.70 + 0.18
		47 Hz - 10 kHz	0.08 + 0.13
		10 kHz - 50 kHz	0.55 + 0.18
		50 kHz - 100 kHz	1.80 + 0.25
Resistance[6]	200.0000 Ω	1 mA	0.013 + 0.003
	2.000000 kΩ	1 mA	0.012 + 0.002
	20.00000 kΩ	100 µA	0.012 + 0.002
	200.0000 kΩ	10 µA	0.020 + 0.003
	2.000000 MΩ	1 µA	0.060 + 0.004
	20.00000 MΩ	100 nA	0.200 + 0.003
DC Current[7]	2.000000 mA	< 25 mV	0.050 + 0.050
	20.00000 mA	< 250 mV	0.050 + 0.005
	200.0000 mA	< 55 mV	0.050 + 0.040
	2.000000 A	< 520 mV	0.200 + 0.005

1. Specifications are for 1 hour warm up, within 1 hour self-cal, aperture ≥ 0.5 sec; null measurement for DCV, Ω, DCI.
2. For temperatures outside the range of 23 °C ± 5 °C, but within 0 to 50 °C, add 0.1 × accuracy specification per °C.
3. 20% overrange on all ranges.
4. Minimum input specified: 20 mV or 5% of range, whichever is larger.
5. Signal is limited to $8x10^6$ volt Hz product. For example, at 100 kHz, the highest input is 80 V.
6. Specifications are for 4-wire resistance measurements, for 2-wire, add 1 mΩ.
7. For 2 mA and 200 mA DCI ranges, resolution is limited to 5½ digits.

M9181A Technical Specifications and Characteristics (continued)

M9181A: Accuracy specifications ±(% of reading + % of range)[1,2,3]			
Function	Range	Frequency, test current or burden voltage	1 year 23 °C ± 5 °C
True RMS, AC current[4]	2.000000 mA	10 Hz - 20 Hz	2.90 + 0.20
		20 Hz - 47 Hz	1.00 + 0.20
		47 Hz - 1 kHz	0.12 + 0.20
		1 kHz - 10 kHz	0.22 + 0.20
	20.00000 mA	10 Hz - 20 Hz	2.80 + 0.15
		20 Hz - 47 Hz	1.00 + 0.15
		47 Hz - 1 kHz	0.16 + 0.15
		1 kHz - 10 kHz	0.40 + 0.20
	200.0000 mA	10 Hz - 20 Hz	2.80 + 0.20
		20 Hz - 47 Hz	1.00 + 0.20
		47 Hz - 1 kHz	0.20 + 0.11
		1 kHz - 10 kHz	0.40 + 0.20
	2.000000 A	10 Hz - 20 Hz	2.70 + 0.25
		20 Hz - 47 Hz	0.90 + 0.30
		47 Hz - 1 kHz	0.35 + 0.20
		1 kHz - 10 kHz	0.50 + 0.25

1. Specifications are for 1 hour warm up, within 1 hour self-cal, aperture ≥ 0.5 sec; null measurement for DCV, Ω, DCI.
2. For temperatures outside the range of 23 °C ± 5 °C, but within 0 to 50 °C, add 0.1 × accuracy specification per °C.
3. 20% overrange on all ranges.
4. Minimum input specified: 0.2 mA or 5% of range, whichever is greater.

M9181A Sensitivity (typ)		
Function	**Lowest range**	**Sensitivity**
DCV	200.0000 mV	100 nV
ACV	200.0000 mV	100 nV
Resistance	20.0000 Ω	100 µΩ
DCI	2.000000 mA	10 nA
ACI	2.000000 mA	1 nA

M9182A / M9183A Technical Specifications and Characteristics

M9182A and M9183A: Accuracy specifications ±(% of reading + % of range)[1,2]

Function	Range[3]	Frequency	24 hour 23 °C ± 1 °C	90 day 23 °C ± 5 °C	1 year 23 °C ± 5 °C
DC voltage [15]	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 + 0.0002	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 + 0.07	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	1.00 + 0.09
		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 + 0.07	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	1.00 + 0.08
		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	1.10 + 0.08
		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

M9182A / M9183A Technical Specifications and Characteristics (continued)

M9182A and M9183A: Accuracy specifications ±(% of reading + % of range)[1,2]

Function	Range [3]	Frequency, test current or burden voltage	24 hour 23 °C ± 1 °C	90 day 23 °C ± 5 °C	1 year 23 °C ± 5 °C
Resistance [7, 15]	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 kΩ	1 mA	0.003 + 0.002	0.008 + 0.002	0.012 + 0.002
	20.00000 kΩ	100 µA	0.003 + 0.002	0.008 + 0.002	0.012 + 0.002
	200.0000 kΩ	10 µA	0.006 + 0.002	0.010 + 0.002	0.016 + 0.003
	2.000000 MΩ	1 µA	0.018 + 0.002	0.030 + 0.003	0.040 + 0.004
	20.00000 MΩ	100 nA	0.120 + 0.002	0.130 + 0.003	0.200 + 0.003
	200.0000 MΩ (M9183A , 2-wire only)	4 nA	0.800 + 0.013	1.000 + 0.015	1.300 + 0.025
DC current [15]	200.0000 nA (M9183A only)	< 100 µV	0.130 + 0.020	0.160 + 0.023	0.170 + 0.030
	2.000000 µA (M9183A only)	< 100 µV	0.050 + 0.004	0.080 + 0.003	0.210 + 0.008
	20.00000 µA (M9183A only)	< 100 µV	0.050 + 0.002	0.080 + 0.003	0.130 + 0.004
	200.0000 µA (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	1Hz - 20 Hz	0.08 + 0.01	0.08 + 0.01	0.08 + 0.01
		20 Hz - 130 Hz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		130 Hz - 640 Hz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		640 Hz - 2.5 kHz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		2.5 kHz - 40 kHz	0.03 + 0.01	0.03 + 0.01	0.03 + 0.01
		40 kHz - 200 kHz	0.05 + 0.01	0.05 + 0.01	0.05 + 0.01
		200 kHz - 300 kHz	0.07 + 0.01	0.07 + 0.01	0.07 + 0.01

M9182A / M9183A Technical Specifications and Characteristics (continued)

M9182A and M9183A: Accuracy specifications ±(% of reading + % of range)[1,2]

Function	Range	Full scale reading or resolution	24 hour 23 °C ± 1 °C	90 day 23 °C ± 5 °C	1 year 23 °C ± 5 °C
Single shot duty cycle[11] [M9183A only]	2 - 100 Hz	0.02 %	0.03 ± 0.03	0.03 ± 0.03	0.03 ± 0.03
	100 Hz - 1 kHz	0.20 %	0.03 ± 0.30	0.03 ± 0.30	0.03 ± 0.30
	1 - 10 kHz	2.00 %	0.03 ± 3.00	0.03 ± 3.00	0.03 ± 3.00
Single shot pulse width[12, 14] [M9183A only]	14 µs - 62.5 ms	1 µs	.01 ± 4 µs	01 ± 4 µs	01 ± 4 µs
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 µF	1.1999 µF	1.00 + 0.10	1.00 + 0.10	1.00 + 0.10
	10.000 µF	11.999 µF	1.00 + 0.10	1.00 + 0.10	1.00 + 0.10
	100.00 µF	119.99 µF	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 ≥ 0.5 sec. Slow AC filter for AC measurements only.
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. 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 8x106 Volt Hz product. For example, at 32 kHz, the highest input is 250 V.
6. For inputs from 5 mV to 15 mV, add 100 µV to the specification.
7. Specifications are for 4-wire resistance measurements, for 2-wire, add 1 mΩ additional error to the specification; for offset compensated ohms (M9183A only), add 0.02% of range.
8. Minimum input specified: 60 µA or 1.5% of range, whichever is larger; for inputs < 5% of full scale, add 0.02% of range.
9. For inputs from 60 to 120 µA, add 10 µA to the specification; for inputs < 5% of full scale, add 0.1% of range.
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 200 kHz , or 40% of range for 200 kHz to 300 kHz..
11. Specifications are % of reading (0.03) ± adder.
12. Specifications are % of reading + time.
13. Specifications apply to input signals ≥ 5% of range.
14. Maximum wait time for duty cycle and period is 5 seconds.
15. DCV, DCI & Resistance specifications only valid with the math NULL feature enabled.

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 50 °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.

M9182A / M9183A Technical Specifications and Characteristics (continued)

M9182A and M9183A Sensitivity (nom)		
Function	**Lowest Range**	**Sensitivity**
DCV	200.0000 mV	0.1 µV
ACV	200.0000 mV	0.1 µV
Resistance (M9183A)	20.00000 Ω	10 µΩ
Resistance (M9182A)	200.0000 Ω	100 µΩ
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 ± 5 °C**
RTD temperature measurement[2,3]	pt385	100 Ω, 200 Ω	0.01 °C	-150 to 650 °C	± 0.06 °C
		500 Ω, 1 kΩ	0.01 °C	-150 to 650 °C	± 0.03 °C
	Cu (Copper)	Less than 12 Ω	0.01 °C	-100 to 200 °C	± 0.18 °C at ≤ 20 °C ± 0.05 °C otherwise
		Higher than 90 Ω	0.01 °C	-100 to 200 °C	± 0.10 °C at ≤ 20 °C ± 0.05 °C otherwise
Thermocouple temperature measurement[4,5]	B	NA	0.01 °C	2200 °C	± 0.38 °C
	E	NA	0.01 °C	1200 °C	± 0.035 °C
	J	NA	0.01 °C	2000 °C	± 0.06 °C
	K	NA	0.01 °C	3000 °C	± 0.07 °C
	N	NA	0.01 °C	3000 °C	± 0.10 °C
	R	NA	0.01 °C	2700 °C	± 0.25 °C
	S	NA	0.01 °C	3500 °C	± 0.35 °C
	T	NA	0.01 °C	550 °C	± 0.06 °C
Thermistor[3]	2.25 kΩ	NA	0.01 °C	-80 to 150 °C	± 0.1 °C
	5 kΩ	NA	0.01 °C	-80 to 150 °C	± 0.1 °C
	10 kΩ	NA	0.01 °C	-80 to 150 °C	± 0.1 °C

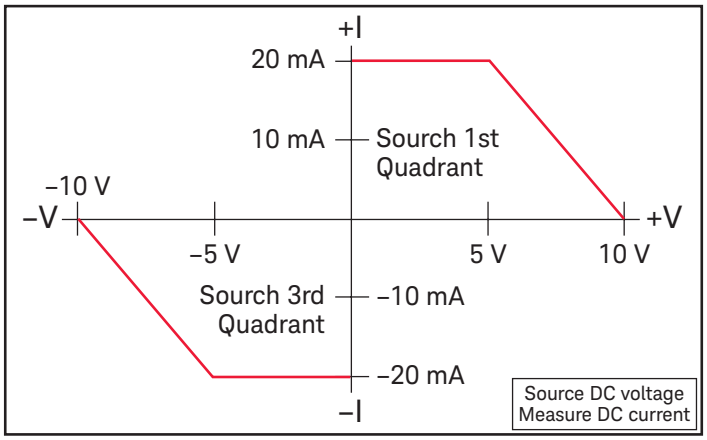
1. Specifications are for one hour warm up, within one hour self-cal, aperture ≥ 0.5 sec.
2. 4-wire RTD measurement, R0 variable 1 Ω to 7 k Ω.
3. For total measurement accuracy, add temperature probe error.
4. For total measurement accuracy, add thermocouple error and cold junction compensation.
5. DMM linearization temperature range may be greater than that of the thermocouple device.

M9182A / M9183A Technical Specifications and Characteristics (continued)

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

M9183A source DC voltage, measure DC voltage		
Parameter	**Closed Loop**	**Open Loop**
DC voltage source (output) range	+10 to -10 V	+10 to -10 V
DC source sink current at 5 V output	5 mA	5 mA
DAC resolution (nom)	18 bits /12 bits	12 bits
DC voltage source accuracy 1 Year, 23°± 5° C	0.015% ± 0.0004	1.00% ± 0.04
Settling time (typ)	100 ms/1 ms	1 ms
Source resistance (nom)	200 ohms	200 ohms

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)[1,2,3,4]	2.0% ± 0.4%
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.
4. If DCV source > 6 V, then add current * 4 ohms; if DCV source > 8 V, then add current * 30 ohms.

M9182A / M9183A Technical Specifications and Characteristics (continued)

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 µs	
Trigger input impedance	3 kΩ	
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 µs	
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 µs to 15 s
	Resolution	1 µs to 65 ms and 16 µs above 65 ms
Reading storage		Circular buffer - 80 readings
Multi Sample Mode (DCV and DCI functions only)	Aperture range	2.5 µs to 160 ms (M9183A)
		130 µs to 160 ms (M9182A)
	Maximum read interval range	1sec for aperatures ≥ 625 µs, else 65 ms
	Reading per trigger	Up to 80 readings (maximum of 78 pre-triggers or a maximum of 80 post triggers)
	Trigger sources	PXI trigger, external DIN connector, and analog threshold (accuracy within 5% of range)

Measurement Characteristics

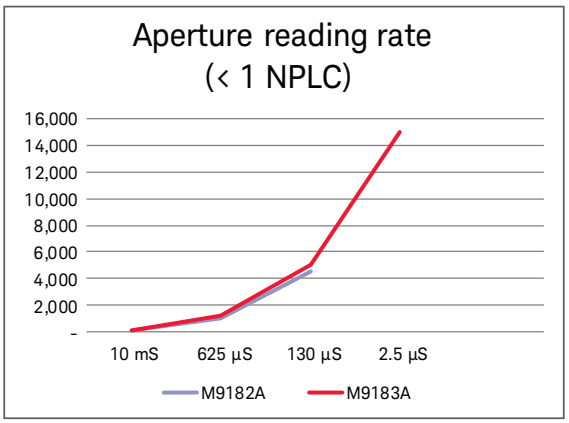
M9181A Resolution vs. Aperture and Reading Rate for DCV, DCI, Ω

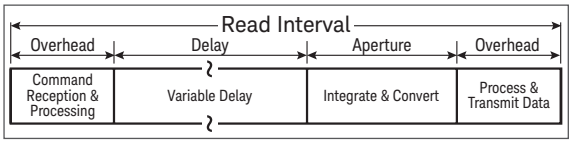
Measurement aperture	Maximum readings per second	Resolution
1.28 s	0.8	6½ digits (21 bits)
160 ms	6	6 digits (20 bits)
20 ms	45	5½ digits (18 bits)
10 ms	85	5 digits (17 bits)
5 ms	150	4½ digits (16 bits)

M9182A / M9183A 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 µs	1,200	5½ digits (18 bits)
130 µs	4,500	4½ digits (14 bits)
2.5 µs	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 µs. Results will vary, depending on what PC hardware, PXI hardware, and driver are used.





Time frame of a single measurement
Minimum read interval = 66 µs (M9183A)
Minimum read interval = 222 µs (M9182A)

Measurement Characteristics (continued)

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 µs, 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.

System Reading and Throughput Rates (M9182A/3A)

Switching ranges within a function	Aperture (A)	Range change time (ms)
DCV	A ≤ 20 ms	(A × 0.2) + 15
	A > 20 ms	A + 15.6
Resistance (2-wire or 4-wire)	A < 33 ms	(A × 0.05) + 15.5
	A ≥ 33 ms	A + 13
DCI (200 mA or 2 A to any other range)	A ≤ 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 ≥ 16 ms	A + 25
Resistance to DCI	A < 16.66 ms	7.8
	16.66 ms ≤ A < 40 ms	A × 0.65
	40 ms < A < 66.66 ms	7.8
	A ≥ 66.66 ms	(A × 0.51) + 45
DCV to capacitance	A < 33.33 ms	23.4
	A ≥ 33.33 ms	(A × 0.65) + 50
Resistance to capacitance	A ≤ 33.33 ms	23.4
	33.33 ms < A < 80 ms	(A × 2) + 35
	80 ms ≤ A < 160 ms	23.4
	A ≥ 160 ms	160

Measurement Characteristics (continued)

DC voltage	
Measurement method	Delta-sigma A/D conversion
Input resistance	200 mV, 2.0 V ranges: >10 GΩ with typical leakage of < 50 pA;
	M9181A: 20 V, 200 V ranges: 10.0 MΩ
	M9182A/3A: 20 V, 200 V, 300 V ranges: 10.0 MΩ
Input isolation	M9181A: 240 V from Earth ground
	M9182A/3A: 330 VDC, 250 VAC from Earth ground
Input overvoltage protection	M9181A: 300 VDC on voltage inputs
	M9182A/3A: 330 VDC all ranges
DCV noise rejection	M9181A: Normal mode rejection at 50, 60, or 400 Hz ± 0.5%; > 90 dB (apertures ≥ 0.160 s); CMRR (1 kΩ lead imbalance) ≥ 100 dB
	M9182A/3A: Normal mode rejection at 50, 60, or 400 Hz ± 0.5%; > 95 dB (apertures ≥ 0.160 s); CMRR (1 kΩ lead imbalance) ≥ 120 dB
True RMS AC voltage	
Measurement method	M9181A: AC coupled (10 Hz to 100 kHz) true RMS – measures the AC component only. Analog RMS DC converter.
	M9182A/3A: 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 MΩ, in parallel with < 300 pF
Settling time	< 0.5 sec to within 0.1% of final value Fast RMS (M9182A/3A): < 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	M9181A: 250 VAC on voltage inputs
	M9182A/3A: 330 VAC all ranges
ACV noise rejection	Common mode rejection at 50 Hz or 60 Hz; 1 kΩ 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 Voffset + (I*R) < 2.2 V for ranges ≥ 2 kΩ Voffset + (I*R) < 0.22 V for ranges < 2 kΩ
Maximum test voltage	M9181A: 240 mV for 200 Ω ranges; 2.4 V for 20 kΩ to 20 MΩ ranges
	M9182A/3A: 240 mV for 20 Ω and 200 Ω ranges; 2.4 V for 20 kΩ to 20 MΩ ranges
	M9183A only: 1.0 V for 200 MΩ range
Maximum lead resistance (4-wire)	50 kΩ for 200 kΩ, 2.0 MΩ, and 20 MΩ ranges; 5 kΩ for 20 kΩ range 500 Ω for 200 Ω and 2 kΩ ranges; 50 Ω for 20 Ω range
Input protection	M9181A: 300 V on all ranges M9182A/3A: 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 µA, 20 µA, 2 µA, 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 (continued)

Frequency and period (M9182A and M9183A)	
Measurement method	Direct (conventional) counting
Input impedance	1 MΩ 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 (M9182A and M9183A)	
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 V LO*, 2-wire Ω IN, DCV OUT I HI*, 4-wire Ω IN I LO*, 4-wire Ω IN Sync OUT** External Trigger IN** Trigger and Sync common**	Sheathed banana jack Sheathed banana jack Sheathed banana jack Sheathed banana jack DIN 7, pin 2 DIN 7, pin 7 DIN 7, pin 4
Safety	M9181A: Complies with IEC 61010-1, CAT II 240 V, pollution degree 2 M9182A/M9183A: Complies with IEC 61010-1, CAT II 300 V, pollution degree 2	
EMC	Complies with EN61326-1 Industrial Environment	
Warm-up time	1 hour	

* Do not connect the V HI and V LO or I HI and I LO connectors to anything when the measurement function does not utilize those connectors.
** M9182A & M9183A only

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

Model	Description
M9181A	PXI 6½ digit multimeter, basic features
M9182A	PXI 6½ digit multimeter, high performance
M9183A	PXI 6½ digit multimeter, enhanced performance
DMM units include:	Getting started guide, software drivers, user and service documentation (on CD ROM), Keysight I/O libraries

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, MATLAB, VEE
Keysight IO Libraries	Includes: VISA Libraries, Keysight Connection Expert, IO Monitor

Calibration and Warranty

Advantage services: calibration and warranty
Keysight 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
R-50C-021-3	Yearly ANSI Z540-1-1994 calibration, for 3 years (M9182A & M9183A only)
R-50C-021-5	Yearly ANSI Z540-1-1994 calibration, for 5 years (M9182A & M9183A only)

Warranty
Standard warranty is 1 year

Accessories

Model	Description
34138A	Test lead set

Related products

Model	Description
M9018A	18-slot PXIe chassis
M9021A	PCIe cable interface to an external system controller
M9036A	Embedded controller
M9101A	PXI high-density multiplexer, 64 channels, reed relays
M9103A	PXI high-density multiplexer, 99 channels, armature relays
M9120A	PXI high-density matrix switch, 4x32, armature relays
M9121A	PXI high-density matrix switch, 4x64, reed relays

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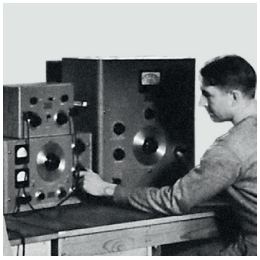

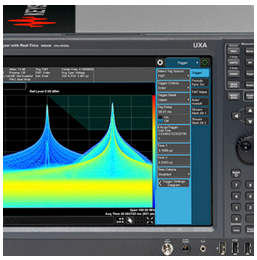

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