Agilent M9181A PXI Digital Multimeter

Data Sheet

6½ Digit, Basic Features

- 6½ digit resolution
- DCV basic one year accuracy: 90 ppm
- Six standard measurements: DCV, ACV, DCI, ACI, 2- and 4-wire resistance
- Floating isolation (CAT II) up to 240 V

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OVERVIEW

Product Description

Agilent's M9181A PXI digital multimeter provides the most popular measurement functions, including DCV, ACV, DCI, ACI, 2- and 4-wire resistance at 6½ digits of resolution. The M9181A delivers trustworthy measurements at an affordable price.

Applications

- Aerospace and defense
- Automotive electronics test
- Industrial electronics test

Features

- 6½ digit resolution
- Up to 150 readings per second at 4½ digits
- Basic 1 year DCV accuracy of 90 ppm
- DCV, ACV, DCI, ACI, 2- and 4-wire resistance
- Floating isolation (CAT II) to 240 V (floating measurement to 240 V maximum)
- Software drivers to support most common programming environments
- PXI form factor
- Chassis connector compatibility: PXI-1 (J-1 only)

Customer values

- The most common DMM measurements
- Measurements you can trust
- Low cost solution
- Application development in the environment of your choice reduces development time
- Customer supportable calibration procedures and calibration services available from Agilent

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	DC basic 1 year accuracy	Maximum reading rate at 4½ digits	Other measurements	Triggering	DC source
M9181A	Basic features PXI DMM	90 ppm	150 rdgs/sec	None	Immediate	n/a
M9182A	High performance PXI DMM	40 ppm	4,500 rdgs/sec	Temperature, capacitance, frequency, period	Immediate, analog threshold, PXI trigger bus	n/a
M9183A	Enhanced performance PXI DMM	40 ppm	15,000 rdgs/sec	Offset compensated resistance, temperature, capacitance, frequency, period, pulse width, duty cycle, totalizer/event counter	Immediate, analog threshold, PXI trigger bus	± 10 V ±(1.2 µA to 12 mA)

EASY SETUP ... TEST ... AND MAINTENANCE

Hardware platform

Compliance

The M9181A 6½ digit, DMM is PXI compliant, using either cPCI (J1) or PXI-1 (J1). The M9181A uses fast data interfaces and can be integrated with other test and automation modules in a PXI, Compact PCI, or Hybrid chassis. The PXI format offers high performance in a small, rugged package. It is ideal for many automated test systems. A wide array of complementary PXI products are currently available. Agilent products include switches, multiplexers, digitizers, waveform generators and local oscillators.

Software platform

IO Libraries

Agilent IO Libraries Suite offers fast and easy instrument connections. IO Libraries Suite 16.1 adds support for PXI, helping you display all of the modules in your system and view information about installed software. In addition, IO Libraries Suite 16.1 and newer versions allow 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 include software drivers for Windows®XP, Windows Vista and Windows 7. These 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 that demonstrate DMM setup and basic functionality are included for LabVIEW, Visual Basic and C/C++, C#, and MATLAB. These application code examples help you integrate the DMM module into your measurement system.

Soft front panel

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

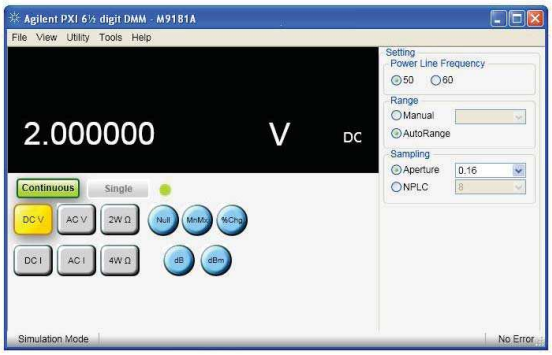

Figure 1. M9181A soft front panel

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 incorporate the driver calls into the application program – enabling fast and easy program development.

Calibration

Each M9181A is factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate.

Calibration is required once per year. A calibration procedure allows you to do in-rack calibration using standard calibration sources. Alternatively, Agilent and third party calibration labs offer calibration services for the M9181A DMM.

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.

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).

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.

MEASUREMENT CHARACTERISTICS

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 V LO, 2-wire Ω IN I HI, 4-wire Ω IN I LO, 4-wire Ω IN	Sheathed banana jack Sheathed banana jack Sheathed banana jack Sheathed banana jack
Safety	Complies with IEC 61010-1, CAT II 240 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

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; 20 V, 200 V ranges: 10.0 MΩ
Input isolation	240 V from earth ground
Input overvoltage protection	300 VDC on voltage inputs
DCV noise rejection	Normal mode rejection at 50, 60, or 400 Hz ± 0.5%; > 90 dB (apertures ≥ 0.160 s); CMRR (1 kΩ lead imbalance) ≥ 100 dB

True RMS AC voltage	
Measurement method	AC coupled (10 Hz to 100 kHz) true RMS — measures the AC component only Analog RMS DC converter
Crest factor	Maximum crest factor of 4 at full scale, 7 at 10% of range
Input impedance	1 MΩ, in parallel with capacitance of less than 300 pF
Settling time	< 0.5 sec to within 0.1% of final value
Peak input	8 x 10^6 volt Hz product (example: 80 V @ 100 kHz)
Input overvoltage protection	250 VAC on voltage inputs
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
Maximum test voltage	240 mV for 200 Ω ranges; 2.4 V for 20 kΩ to 20 MΩ ranges
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	300 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
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

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

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)

CONFIGURATION AND ORDERING INFORMATION

Hardware[1]

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

1. The M9181A is 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 environments	Visual Studio® (VB.NET, C#, C/C++)®, LabVIEW, MATLAB
Agilent IO Libraries	Includes: VISA Libraries, Agilent Connection Expert, IO Monitor

Warranty and Calibration

Advantage Services: Calibration and Warranty	
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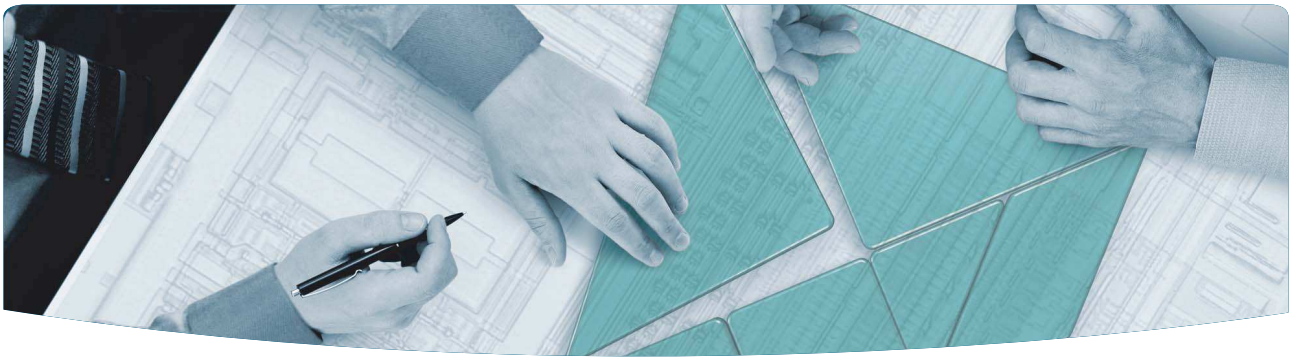
Calibration	
R-50C-011-3	Yearly calibration, for 3 years
R-50C-011-5	Yearly calibration, for 5 years
Warranty	
	Standard warranty is 1 year
R-51B-001-3C	1 year return-to-Agilent warranty extended to 3 years
R-51B-001-5C	1 year return-to-Agilent warranty extended to 5 years

Accessories

Model	Description
34138A	Test lead set

Related products

Model	Description
M9018A	18-slot PXIe chassis
M9021A	PXIe system interface
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
M9182A	PXI multimeter, 6 ½ digit, high performance
M9183A	PXI multimeter, 6 ½ digit, enhanced performance



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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