M9182A/M9183A
PXI 6½ Digit Multimeter

KEYSIGHT

VERIFICATION PROCEDURE

Notices

Copyright Notice

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Trademarks

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

PXI is a registered trademark of the PXI Systems Alliance.

Safety Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

	Caution, risk of danger (refer to this manual for specific Warning or Caution information)		Earth (ground) terminal
	Indicates that antistatic precautions should be taken.		

Safety Considerations

Read the information below before using this instrument.

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards for design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product must not be impaired if it is used in a manner specified in the operation instructions.

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power. Note the instrument's external markings described under Safety Symbols.

Fuse Installation

To replace a blown fuse or verify the correct fuse, pull it gently from the fuse drawer and insert the correct working fuse. Use only the fuse below.

Keysight Part Number	Description	Fuse type
2110-1820	Fuse 2.5A, 450VDC Fast Acting	Board Mount (Cartridge Style Excluded)

Ground the Instrument

PXI chassis are provided with a grounding-type power plug. The instrument chassis and cover must be connected to an electrical ground to minimize shock hazard. The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate the Keysight module/chassis in the presence of flammable gases or fumes.

Do Not Operate Near Flammable Liquids

Do not operate the Keysight module/chassis in the presence of flammable liquids or near containers of such liquids.

Do Not Remove Instrument Cover

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Cleaning

Clean the outside of the Keysight module, chassis, or accessory with a soft, lint-free, slightly dampened cloth. Do not use detergent or chemical solvents.

Keep Away From Live Circuits

Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT Operate Damaged Equipment

Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to an Keysight Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

DO NOT Block the Primary Disconnect

The primary disconnect device is the appliance connector/power cord when a chassis used by itself, but when installed into a rack or system the disconnect may be impaired and must be considered part of the installation.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Keysight Sales and Service Office to ensure that safety features are maintained.

In Case of Damage

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

WARNING

IEC Measurement Category II. The HI and LO input terminals may be connected to mains in IEC Category II installations for line voltages up to 250 VAC_{rms}. To avoid the danger of electric shock, do not connect the inputs to mains for line voltages above 250 VAC_{rms}. The M9181A DMM is limited to 240 VAC_{rms}. See below for further information.

The DMM comes installed with four shields (bottom, top and two edge strips). These shields must be in place for performance and safety reasons. Removal or improper assembly of these shields can result in lethal voltages occurring within your PC. Be sure to check your installation before closing the cover on your chassis.

WARNING

During and after installing your DMM, verify that no loose wires or ribbon cables infringe upon any of the internal circuits of the DMM, as this may apply measurement voltages to your chassis, causing electrocution and/or damage to your chassis!

To avoid shock hazard, install the DMM only into a chassis that has its power connector connected to a power receptacle with an earth safety ground.

When making any measurements above 50 VDC or 40 VAC, only use safety test leads, such as Keysight test leads.

IEC Measurement Category II Overvoltage Protection

To protect against the danger of electric shock, the Keysight M9182A/M9183A digital multimeters (DMMs) provide overvoltage protection for line-voltage mains connections meeting both of the following conditions:

The HI and LO input terminals are connected to the mains under Measurement Category II conditions, defined below,

and

The mains are limited to a maximum line voltage of 250 VAC_{rms} (240 VAC_{rms} for the M9181A).

IEC Measurement Category II includes electrical devices connected to mains at an outlet on a branch circuit. Such devices include most small appliances, test equipment, and other devices that plug into a branch outlet or socket. The M9182A/M9183A DMMs may be used to make measurements with the HI and LO inputs connected to mains in such devices, or to the branch outlet itself (up to 250 VAC_{rms}, or 240 VAC_{rms} for the M9181A). However, the DMMs may not be used with their HI and LO inputs connected to mains in permanently installed electrical devices such as the main circuit-breaker panel, sub-panel disconnect boxes, or permanently wired motors. Such devices and circuits are subject to overvoltages that may exceed the protection limits of the M9182A/M9183A.

NOTE The M9182A and M9183 can measure voltages up to 250 VAC_{rms} in circuits that are isolated from mains (CAT None).

CAUTION **This is a sensitive measurement apparatus by design and may have some performance loss when exposed to ambient continuous electromagnetic phenomenon.**

Regulatory Markings

Symbol	Description
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
CE CAN ICES/NMB-001(A) ISM GRP 1-A	The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives. CAN ICES/NMB-001(A) indicates that this ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada. ISM GRP 1-A indicates that this is an Industrial Scientific and Medical Group 1 Class A product.
	This symbol indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.
	This symbol is a South Korean Class A EMC Declaration. This is a Class A instrument suitable for professional use and in electromagnetic environment outside of the home.
	The CSA mark is a registered trademark of the Canadian Standards Association.

South Korean Class A EMC declaration:

Information to the user:

This equipment has been conformity assessed for use in business environments. In a residential environment this equipment may cause radio interference.

– This EMC statement applies to the equipment only for use in business environment.

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- 사용자 안내문은"업무용 방송통신기자재"에만 적용한다.

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The crossed out wheeled bin symbol indicates that separate collection for waste electric and electronic equipment (WEEE) is required, as obligated by the EU DIRECTIVE and other National legislation.

Please refer to keysight.com/go/takeback to understand your Trade in options with Keysight in addition to product takeback instructions.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/pxi-dmm
  (product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
  (worldwide contact information for repair and service)
- www.keysight.com/find/tips
  (information on preventing damage to your Keysight equipment)

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Table of Contents

Verification

This manual contains procedures for calibrating and verifying the performance of the Keysight M9182A and M9183A PXI 6½ Digit Multimeters (DMMs).

The following table lists the test equipment recommended for calibration and performanceverification. You may substitute calibration standards of equivalent accuracy.

Application	Recommended equipment	Accuracy requirements
DC Voltage	Fluke 5720A	<1/5 instrument 24 hour spec
DC Current	Fluke 5720A 10 MΩ Resistor[a]	<1/5 instrument 24 hour spec
Resistance	Fluke 5720A	<1/5 instrument 24 hour spec
AC Voltage	Fluke 5720A	<1/5 instrument 24 hour spec
AC Current	Fluke 5720A	<1/5 instrument 24 hour spec
Frequency	Fluke 5720A	<1/5 instrument 24 hour spec
Capacitance	IET SCA–1μF	<1/5 instrument 24 hour spec
DCV Source	34410 or equivalent	<1/5 instrument 24 hour spec
DCI Source	Fluke 5720A, Keysight 34410A, or equivalent	<1/5 instrument 24 hour spec

[a] 10 MΩ resistor (25 ppm / °C, >250 V) measured by Keysight 3458A or equivalent

Performance Verification Tests

Use these performance verification tests to verify the measurement performance of the instrument. The performance verification tests use the instrument's specifications listed in the product data sheet, located at www.keysight.com/find/pxi-dmm.

NOTE **To meet the product specifications, perform instrument self-calibration at least once per day. This is a simple software command (AgM918x_AutoCalibrate) that takes less than one minute to perform.**

You can perform three different levels of performance verification tests:

- **Self-Test** – A series of internal verification tests that give a high confidence that the instrument is operational. Performs an "AutoCalibrate" command.
- **Quick Verification** – A combination of the internal self–tests and selected verification tests.
- **Performance Verification Tests** – An extensive set of tests that are recommended as an acceptance test when you first receive the instrument or after performing adjustments.

These three levels of performance verification are described below.

Self–Test

The DMM automatically runs a brief power–on self–test whenever you turn on the instrument. This limited test assures that the instrument is capable of operation, but it does not verify that measurements meet product specifications.

Self-test should be run before beginning calibration or verification. Run the self-test from the Tools menu on the Soft Front Panel (SFP).

- If repair is required, contact a Keysight Service Center.
- If all tests pass, you have a high degree of confidence (~90%) that the instrument is operational.

Quick Performance Check

The quick performance check is a combination of internal self–test and an abbreviated performance test (specified by the letter Q in the performance verification tests). This test provides a simple method to achieve high confidence in the instrument's ability to functionally operate and meet specifications. These tests represent the absolute minimum set of performance checks recommended following any service activity. Auditing the instrument's performance for the quick check points (designated by a Q) verifies performance for "normal" accuracy drift mechanisms. This test does not check for abnormal component failures.

To perform the quick performance check, do the following:

– Perform a self-test from the Tools menu on the Soft Front Panel.

– Perform the performance verification tests indicated with the letter Q.

If the DMM fails the quick performance check, adjustment or repair is required.

Performance Verification Tests

The performance verification tests are recommended as acceptance tests when you first receive the instrument. The acceptance test results should be compared against the 90 day test limits. You should use the 24–hour test limits only for verification within 24 hours after performing the adjustment procedure. After acceptance, you should repeat the performance verification tests at every calibration interval.

If the instrument fails performance verification, adjustment or repair is required.

Adjustment is recommended at every calibration interval. If adjustment is not made, you must establish a 'guard band', using no more than 80% of the specifications, as the verification limits.

Input Connections

Shielded, twisted–pair, Teflon interconnect cables of minimum length are recommended between the calibrator and the multimeter. HI and HI Sense should be connected with one twisted pair, and LO and LO Sense should be connected with another. Cable shields should be earth ground referenced. This configuration is recommended for noise reduction and settling time performance during calibration

Test Considerations

Errors may be induced by AC signals present on the input leads during a self–test. Long test leads can also act as an antenna, picking up AC signals.

For optimum performance, all procedures should comply with the following recommendations:

- Ensure that the calibration ambient temperature (Tcal) is stable and between 18 and 28 °C. Ideally the calibration should be performed at 23 °C ±2 °C.
- Ensure ambient relative humidity is less than 80%.
- Allow a 60 minute warmup period with a copper short connected to the voltage input terminals.
- Use shielded twisted pair, Teflon–insulated cables to reduce settling and noise errors. Keep the input cables as short as possible.
- Connect the input cable shields to earth ground. Except where noted in the procedures, connect the calibrator LO source to earth ground at the calibrator. It is important that the LO to earth ground connection be made at only one place in the circuit to avoid ground loops.
- Set the DMM to 32 PLC's for all verification measurements on functions unless otherwise noted in the verification or calibration process.

Because the instrument is capable of making highly accurate measurements, you must take special care to ensure that the calibration standards and test procedures used do not introduce additional errors. Ideally, the standards used to verify and adjust the instrument should be an order of magnitude more accurate than each instrument range full scale error specification.

Null Measurement

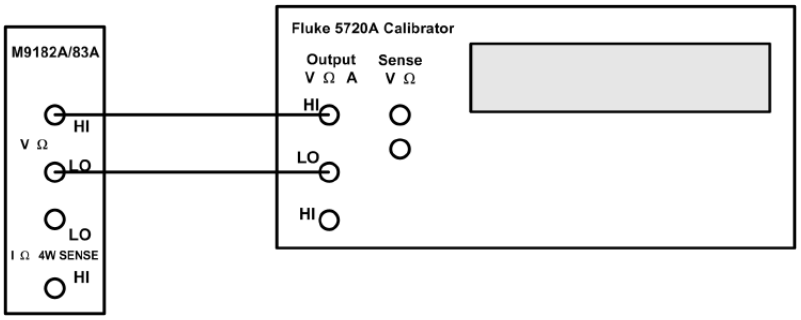
For full accuracy, a null measurement must be performed for the key functions: DC voltage, DC current, and resistance verification measurements. This is done by going to the lowest (most sensitive range) on DCV and OHMS functions and providing a copper short on the input terminals. For the DCI function, the input terminals should be left with no connection.

1. Set the Soft Front Panel to continuous trigger by clicking the Continuous button.
2. Set the Function and Range.
3. Press Null.

The next reading taken by the DMM will become the null value. All subsequent measurements taken on the selected function will have the null value subtracted from the reading.

Test 1: DC Volts Verification Tests

1. Make sure you have read “Test Considerations” on page 18.
2. Connect the calibrator to the input terminals of the DMM, as shown below.



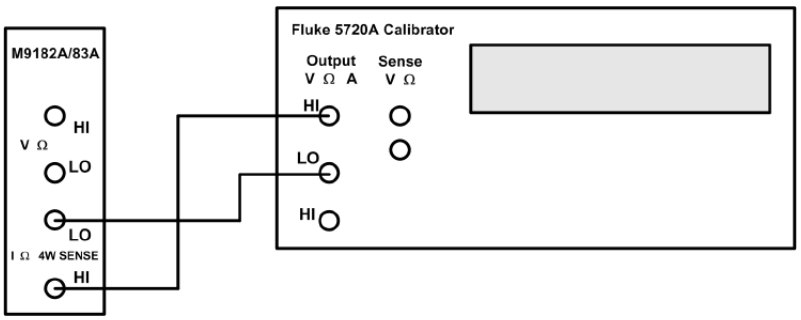
3. Program a null reading and make all DCV measurement in the following table “nulled” to this measurement. See “Null Measurement”, above.
4. On the M9182A/83A DMM, select each function and range in the order shown in thefollowing table. Using the calibrator, provide the input shown in the same table.
5. Make a DC voltage measurement on the M9182A/83A DMM and return the result. Compare measurement results to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling when using the Fluke 5720A.

A "Q" in the Quick Check column indicates a quick performance verification test point. All measurements are taken at 32 NPLC

Calibrator input voltage (V)	DMM function	DMM range (V)	Quick check	Error from nominal (± V)		
				24 hours	90 days	1 year
200.0000E-03	DCV	200.0000E-03	Q	7.0E-06	9.6E-06	12E-06
000.0000E+00	DCV	200.0000E-03	Q	1.0E-06	1.6E-06	2E-06
-200.0000E-03	DCV	200.0000E-03		7.0E-06	9.6E-06	12E-06
2.000000E+00	DCV	2.000000E+00		44E-06	64E-06	86E-06
000.0000E+00	DCV	2.000000E+00		4E-06	4E-06	6E-06
-2.000000E+00	DCV	2.000000E+00	Q	44E-06	64E-06	86E-06
20.00000E+00	DCV	20.00000E+00		920E-06	1.14E-03	1.56E-03
000.0000E+00	DCV	20.00000E+00		120E-06	140E-06	160E-06
-20.00000E+00	DCV	20.00000E+00		920E-06	1.14E-03	1.56E-03
200.0000E+00	DCV	200.0000E+00	Q	6.4E-03	8.2E-03	10.6E-03
000.0000E+00	DCV	200.0000E+00		400E-06	400E-06	600E-06
-200.0000E+00	DCV	200.0000E+00		6.4E-03	8.2E-03	10.6E-03
250.0000E+00	DCV	300.0000E+00		33.1E-03	58.4E-03	63.4E-03
000.0000E+00	DCV	300.0000E+00		600E-06	900E-06	900E-06
-250.0000E+00	DCV	300.0000E+00		33.1E-03	58.4E-03	63.4E-03

Test 2: DC Current Verification Test

1. Make sure you have read "Test Considerations" on page 18.
2. Remove all connections from the DMM, select DCI function and perform a null measurement. (The input terminals should be left open for the null measurement).
3. Connect the calibrator to the Current input terminals of the DMM, as shown below.



4. On the M9182A/83A DMM, select each function and range in the order shown below. Using the calibrator, provide the input shown in the table below.
5. Make a DC current measurement on the M9182A/83A DMM and return the result. Compare measurement results to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling when using the Fluke 5720A.

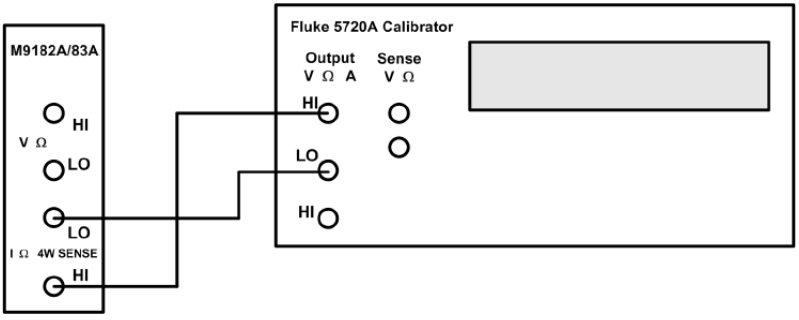
Calibrator input current (A)	DMM function	DMM range (A)	Quick check	Error from nominal (± A)		
				24 hours	90 days	1 year
2.000000E-03	DCI	2.000000E-03		700E-09	1.000E-06	1.360E-06
20.00000E-03	DCI	20.00000E-03	Q	4.40E-06	7.60E-06	9.60E-06
200.0000E-03	DCI	200.0000E-03		90.0E-06	120.0E-06	160.0E-06
2.00000E+00	DCI	2.000000E+00	Q	2.06E-03	3.08E-03	4.10E-03

Low Level DC Current Verification Test

NOTE These tests apply only to the M9183A.

For DCI, 200 µA range:

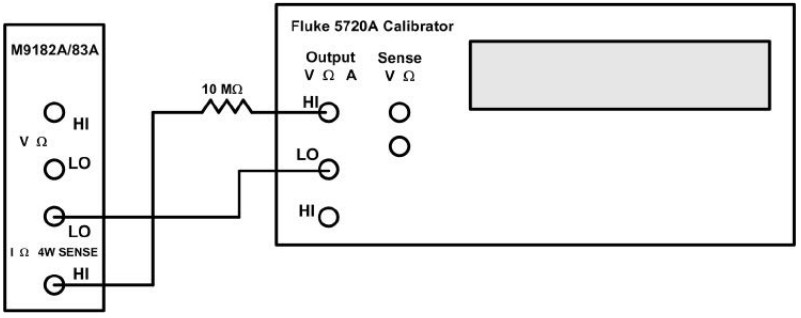
1. Make sure you have read "Test Considerations" on page 18.
2. Perform a null measurement on the DCI function 200 µA range with the DMM input terminals open.
3. Make the following measurements nulled to the above measurement.
4. Connect the calibrator to the Current input terminals of the DMM, as shown below.



5. Select the 200 µA range on the M9182A/83A DMM and apply 200 µA to the current input terminals from the calibrator.
6. Make a DC current measurement on the M9182A/83A DMM and return the result. Compare measurement results to the appropriate test limits shown in the table below. Be certain to allow for appropriate source settling when using the Fluke 5720A.

For DCI ranges 20 µA, 2 µA, and 200 nA, you need to generate a DC current by applying a voltage through a 10 MΩ resistor.

1. Measure the 10 MΩ resistor with the 3458A or equivalent. Write down this value.
2. Perform a null measurement on the 200 nA range with the DMM input terminals open.
3. Set the calibrator to the DCV function.
4. Connect the 10 MΩ to the high output of the calibrator voltage terminal.
5. Connect the other side of the 10 MΩ resistor to the HI current input of the M9182A/83A DMM.
6. Connect the voltage low of the calibrator to the LO current input terminal. The connections in this step and the previous two steps are shown in the figure below.



7. Program the calibrator to DCV: value = Irange × Value of 10 MΩ resistor.
8. Make a DC current measurement on the M9182A/83A DMM and return the result. Compare measurement results to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling when using the Fluke 5720A.

The following examples illustrate how to calculate the proper values in step 8, above.

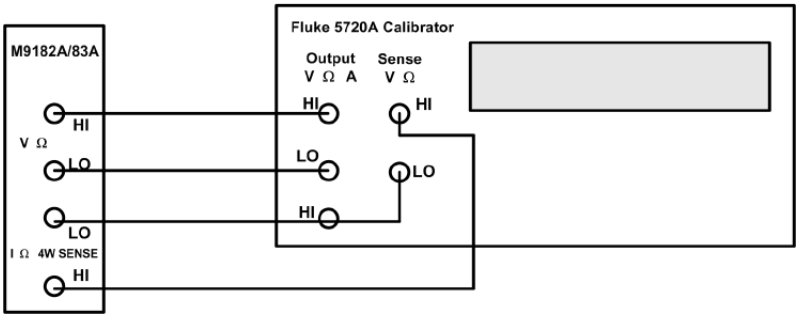
- If the value of the resistor is 10.02000e6 then the value programmed for the 20 µA range is 20e-6 × 10.02000e6 = 200.4 V.
- For the 2 µA range the value programmed is 2e-6 × 10.02000e6 = 20.04 V, and for the 200 nA range the value programmed is 200e-9 × 10.02000e6 = 2.004 V.

WARNING Any voltages greater than 42 V may present a safety hazard. Make certain that these voltages are not accessible.

Calibrator source voltage	Calibrator source IRange (A)	DMM function	DMM range (A)	Quick check	Error from nominal (± A)		
					24 hours	90 days	1 year
	-200.0000E-06	DCI	200.0000E-06	Q	304.0E-09	440.0E-09	600.0E-09
Irange * Measured 10M	20.00000E-06	DCI	20.00000E-06		10.40E-09	16.60E-09	26.80E-09
Irange * Measured 10M	-2.000000E-06	DCI	2.000000E-06		1.080E-09	1.660E-09	4.360E-09
Irange * Measured 10M	200.0000E-09	DCI	200.0000E-09		300.0E-12	366.0E-12	400.0E-12

Test 3: Ohms Gain Verification Test

1. Make sure you have read "Test Considerations" on page 18.
2. Set the calibrator to the 4-wire ohms function.
3. Set the M9182A/83A DMM to 4-wire ohms.
4. Connect the calibrator to the input terminals of the DMM, using all four wires as shown below.



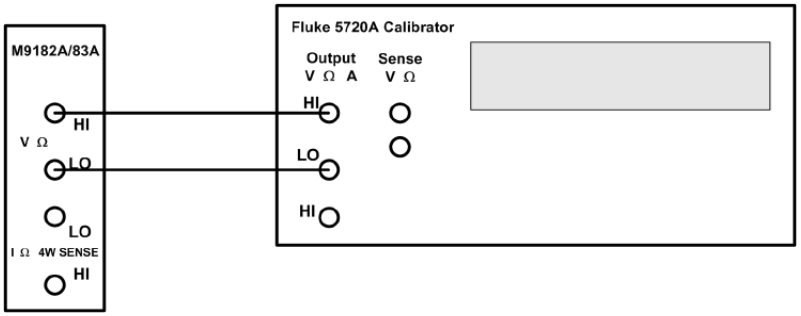
5. Perform a null measurement with the calibrator programmed to 0 Ω and the DMM on the lowest range. Perform the 4-wire ohms measurements below on the M9182A/83A DMM "nulled" to this measurement.
6. Select each range in the order shown below. Using the calibrator, provide the resistance value indicated. Compare measurement results to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling.

Calibrator input resistance (Ω)	DMM function	DMM range (Ω)	Quick check	Error from nominal (± Ω)		
				24 hours	90 days	1 year
000.0000E+00	4W Ω	20.00000E+00[a]		800E-06	800E-06	1.0E-03
19.00000E+00	4W Ω	20.00000E+00[a]	Q	1.56E-03	2.51E-03	3.66E-03
000.0000E+00	4W Ω	200.0000E+00		4.0E-03	4.0E-03	6.0E-03
190.0000E+00	4W Ω	200.0000E+00		11.6E-03	23.0E-03	30.7E-03
000.0000E+00	4W Ω	2.000000E+03		40E-03	40E-03	40E-03
1.900000E+03	4W Ω	2.000000E+03	Q	97E-03	192E-03	268E-03
000.0000E+00	4W Ω	20.00000E+03		400E-03	400E-03	400E-03
19.00000E+03	4W Ω	20.00000E+03		970E-03	1.92E+00	2.68E+00
000.0000E+00	4W Ω	200.0000E+03		4.0E+00	4.0E+00	4.0E+00
190.0000E+03	4W Ω	200.0000E+03		15.4E+00	23.0E+00	36.4E+00
000.0000E+00	4W Ω	2.000000E+06	Q	40E+00	60E+00	60E+00
190.0000E+03	4W Ω	2.000000E+06		382E+00	630E+00	820E+00
000.0000E+00	4W Ω	20.00000E+06		400E+00	600E+00	600E+00
19.00000E+06	4W Ω	20.00000E+06		23.20E+03	25.30E+03	38.60E+03
000.0000E+00	4W Ω	200.0000E+06[a]		26.0E+03	30.0E+03	50.0E+03
100.0000E+06	4W Ω	200.0000E+06[a]		826.0E+03	1.0300E+06	1.3500E+06

[a] The 20 Ω and 200 MΩ ranges are available only on the M9183A.

Test 4: 2-Wire Ohms Function

1. Make sure you have read "Test Considerations" on page 18.
2. Set the M9182A/83A DMM to 2-wire ohms function.
3. Connect the calibrator to the input terminals of the DMM, as shown below.



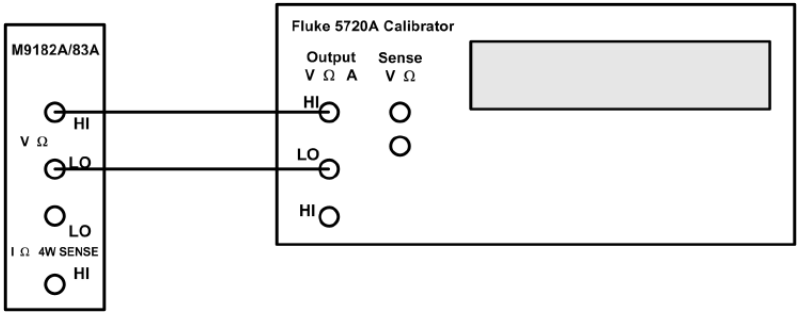
4. On the calibrator, select 2-wire compensation
5. Perform a null measurement with 0 Ω from the calibrator. All 2-wire ohms measurements are now made relative to this null to remove the lead resistance.
6. Select each range in the order shown below. Using the calibrator, provide the resistance value indicated. Compare measurement results to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling.

Calibratior input resistance (Ω)	DMM function	DMM range (Ω)	Quick check	Error from nominal (± Ω)		
				24 hours	90 days	1 year
19.00000E+00	2W Ω	20.00000E+00[a]		2.56E-03	3.51E-03	4.66E-03
190.0000E+00	2W Ω	200.0000E+00		12.6E-03	24.0E-03	31.7E-03
1.900000E+03	2W Ω	2.000000E+03		98E-03	193E-03	269E-03
19.00000E+03	2W Ω	20.00000E+03	Q	971E-03	1.921E+00	2.681E+00
190.0000E+03	2W Ω	200.0000E+03		15.4E+00	23.0E+00	36.4E+00
1.900000E+06	2W Ω	2.000000E+06		382E+00	630E+00	820E+00
19.00000E+06	2W Ω	20.00000E+06		23.20E+03	25.30E+03	38.60E+03
100.0000E+06	2W Ω	200.0000E+06[a]		826.0E+03	1.003E+06	1.350E+06

[a] The 20 Ω and 200 MΩ ranges are available only on the M9183A.

Test 5: Frequency Gain Verification Test

1. Make sure you have read "Test Considerations" on page 18.
2. On the M9182A/83A DMM, select the Frequency function, Voltage range, and Frequency range.
3. Connect the calibrator to the input terminals of the DMM, as shown below.

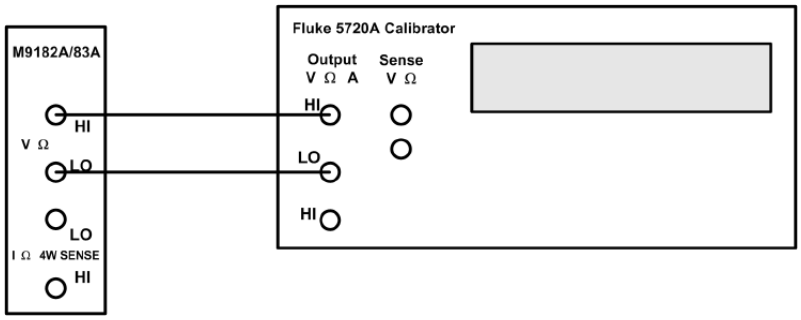


4. Select each range in the order shown below. Using the calibrator, provide the input voltage and frequency indicated. Compare the frequency measurement results from the M9182A/83A DMM to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling.

Calibrator source input frequency (Hz)	Calibrator source voltage input (V)	DMM voltage range (V)	DMM frequency range (Hz)	Error from nominal (± Hz)		
				24 hours	90 days	1 year
10.00000E+00	100.0000E-03	200.0000E-03	2.000000E+00	8.200E-03	8.200E-03	8.200E-03
300.0000E+03	8.000000E+00	20.00000E+00	200.0000E+03	230.0E+00	230.0E+00	230.0E+00

Test 6: AC Volts Verification Test

1. Make sure you have read "Test Considerations" on page 18.
2. Connect the calibrator to the input terminals of the DMM, as shown below.



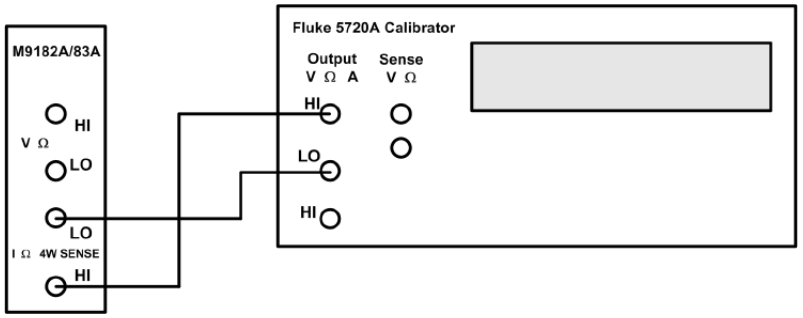
3. On the M9182A/83A DMM, set the AC Volts function and the frequency filter to Slow (10 Hz). Each measurement takes 2.5 seconds to complete.
4. Select each range in the order shown in the following table. Use the calibrator to provide the indicated input voltage and frequency. Note the last three steps set the frequency filter to Fast (400 Hz).
5. Compare AC voltage measurement results from the M9182A/83A DMM to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling.

Calib. source input voltage (V)	Calib. source freq (Hz)	DMM function	DMM voltage range (V)	Quick check	Error from nominal (± V)		
					24 hours	90 days	1 year
10.00000E-03	47.00000E+00	ACV	200.0000E-03		213.0E-06	234.0E-06	235.0E-06
10.00000E-03	50.00000E+03	ACV	200.0000E-03		285.0E-06	326.0E-06	367.0E-06
200.0000E-03	47.00000E+00	ACV	200.0000E-03	Q	360.0E-06	400.0E-06	420.0E-06
20.00000E-03	10.00000E+00	ACV	2.000000E+00		2.600E-03	2.820E-03	3.240E-03
2.000000E+00	47.00000E+00	ACV	2.000000E+00		2.000E-03	2.400E-03	2.600E-03
2.000000E+00	10.00000E+03	ACV	2.000000E+00		2.000E-03	2.400E-03	2.600E-03
20.00000E-03	50.00000E+03	ACV	2.000000E+00		1.264E-03	1.466E-03	1.670E-03
2.000000E+00	100.0000E+03	ACV	2.000000E+00		39.600E-03	41.800E-03	44.000E-03
20.0000E+00	10.00000E+03	ACV	20.00000E+00		22.00E-03	26.00E-03	28.00E-03
20.0000E+00	50.00000E+03	ACV	20.00000E+00	Q	54.00E-03	62.00E-03	70.00E-03
200.0000E+00	47.00000E+00	ACV	200.0000E+00		240.0E-03	300.0E-03	340.0E-03
160.0000E+00	50.00000E+03	ACV	200.0000E+00		588.0E-03	640.0E-03	712.0E-03
3.0000E+00	50.00000E+03	ACV	300.0000E+00		218.4E-03	249.0E-03	309.6E-03
250.0000E+00	1000.0000E+00	ACV	300.00000E+00		325.00E-03	410.0E-03	465.0E-03
200.0000E-03	350.0000E+00	F ACV[a]	20.00000E+00		13.86E-03	15.92E-03	18.00E-03
23.0000E+00	50.00000E+03	F ACV[a]	20.00000E+00		89.30E-03	97.90E-03	106.50E-03
200.0000E-03	100.0000E+03	F ACV[a]	20.00000E+00		34.00E-03	40.40E-03	44.80E-03

[a] Set the frequency filter to Fast (400 Hz).

Test 7: AC Current Verification Test

1. Make sure you have read "Test Considerations" on page 18.
2. Connect the calibrator to the input terminals of the DMM, as shown below.

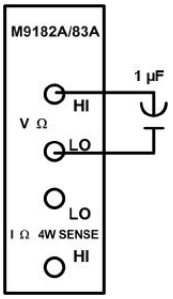


3. Set the AC Current function on the M9182A/83A DMM.
4. Select each range in the order shown below. Using the calibrator, provide the input current and frequency indicated. Compare AC current measurement results from the M9182A/83A DMM to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling.

Calibrator input ACI (A)	Calib. freq. (Hz)	DMM function	DMM range (A)	Quick check	Error from nominal (± A)		
					24 hours	90 days	1 year
60.0000E-06	10.0000E+00	ACI	2.000000E-03		17.620E-06	17.740E-06	17.740E-06
2.30000E-03	20.0000E+00	ACI	2.000000E-03		24.700E-06	24.700E-06	27.000E-06
60.0000E-06	47.0000E+00	ACI	2.000000E-03	Q	13.620E-06	15.050E-06	16.070E-06
2.30000E-03	1.0000E+03	ACI	2.000000E-03		2.520E-06	4.840E-06	6.760E-06
60.0000E-06	10.0000E+03	ACI	2.000000E-03		16.070E-06	16.08E-06	16.13E-06
20.0000E-03	47.0000E+00	ACI	20.00000E-03		24.00E-06	50.00E-06	62.00E-06
200.0000E-03	1.0000E+03	ACI	200.0000E-03	Q	460.0E-06	520.0E-06	620.0E-06
2.0000E+00	1.0000E+03	ACI	2.000000E+00		9.800E-03	10.400E-03	11.000E-03

Test 8: Capacitance Performance Verification Tests

1. Make sure you have read "Test Considerations" on page 18.
2. Set the Capacitance function on the M9182A/83A DMM.
3. Connect the 1 µF capacitor to the input terminals of the DMM, as shown below.

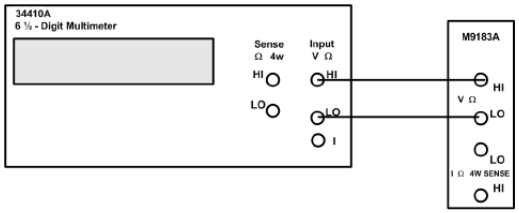


4. Select each range in the order shown below. Compare capacitance measurement results from the M9182A/83A DMM to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling.

Input capacitance (F)	DMM function	DMM range (F)	Quick check	Error from nominal (± F)		
				24 hours	90 days	1 year
1.0000E-06	Capacitance	1.000000E-06		11.000E-09	11.000E-09	11.000E-09
1.0000E-06	Capacitance	10.00000E-06	Q	20.00E-09	20.00E-09	20.00E-09

Test 9: Source VDC Performance Verification Tests

1. Make sure you have read "Test Considerations" on page 18.
2. Set the SourceVMeasV function on the M9182A/83A DMM.
3. Connect the 34410A to the input terminals of the DMM as shown below, on the DCV function.

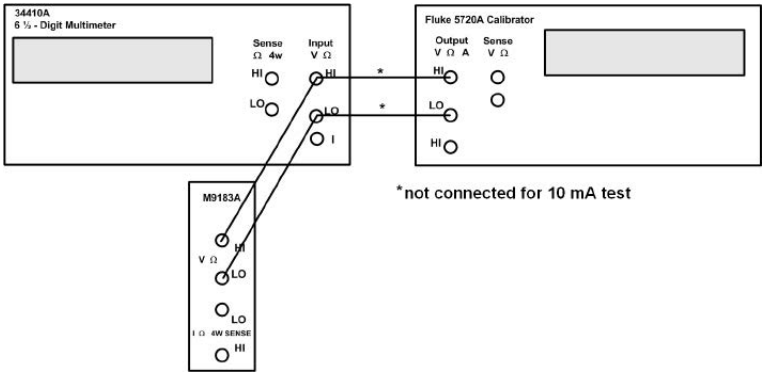


4. Program each output voltage on the M9182A/83A DMM in the order shown below. Measure this voltage with the external DMM. Compare these measurement results to the appropriate test limits shown in the table. Be certain to allow for appropriate source settling.

34410A ext DMM (V)	M9180 series DMM function	M9180 series DMM output voltage (V)	M9180 series DMM resolution (V)	Error from nominal (± V)
10.00000E+00	SourceVMeasV	10	.0001	1.9E-03
1.000000E+00	SourceVMeasV	1	.0001	0.550E-03
-10.00000E+00	SourceVMeasV	–10	.0001	1.9E-03

Test 10: Source IDC Performance Verification Tests

1. Make sure you have read "Test Considerations" on page 18.
2. Set the SourceIMeasureV function on the M9182A/83A DMM.
3. For the 10 mA output level, attach the 34410A to the IDC output terminals of the M9182A/83A DMM as shown below. Put the 34410A in DCI measurement function. Compare measurement results to the appropriate test limits shown in the table.



4. For the remaining output levels, connect the 34410A to the input terminals on the M9182A/83A DMM. Connect the calibrator to the input terminals of the 34410A and set the calibrator to 2-wire Ω. Program the resistance level for each output level to generate 1 V across the 34410A input leads.
5. Select each output current in the order shown below and provide the indicated input. Compare measurement results to the appropriate test limits shown in the table. Be sure to allow for appropriate source settling.

Source calibrator (Ω)	DMM function	DMM output current (A)	Quick check	Error from nominal (± A)		
				24 hours	90 days	1 year
(N/A)	SourceIMeasV	10.00000E-03		182.50E-06	182.50E-06	182.50E-06
1000	SourceIMeasV	1.000000E-03		18.250E-06	18.250E-06	18.250E-06
10,000	SourceIMeasV	100.0000E-06		1.8250E-06	1.8250E-06	1.8250E-06
100,000	SourceIMeasV	10.00000E-06		245.00E-09	245.00E-09	245.00E-09
1,000,000	SourceIMeasV	1.000000E-06		24.500E-09	24.500E-09	24.500E-09

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