

Model DMM7510 Quick Start Guide



Safety precautions

Observe the following safety precautions before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with nonhazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to the user documentation for complete product specifications.

If the product is used in a manner not specified, the protection provided by the product warranty may be impaired.

The types of product users are:

Responsible body is the individual or group responsible for use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating properly, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the user documentation. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, perform safe installations, and repair products. Only properly trained service personnel may perform installation and service procedures.

Keithley Instruments products are designed for use with electrical signals that are measurement, control, and data I/O connections, with low transient overvoltages and must not be directly connected to mains voltage or to voltage sources with high transient overvoltages. Measurement Category II (as referenced in IEC 60664) connections require protection for high transient overvoltages often associated with local AC mains connections. Certain Keithley measuring instruments may be connected to mains. These instruments will be marked as category II or higher.

Unless explicitly allowed in the specifications, operating manual, and instrument labels, do not connect any instrument to mains.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than $30 V_{RMS}$, $42.4 V_{PEAK}$, or 60 V DC are present. A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 V, no conductive part of the circuit may be exposed.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance-limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, ensure that the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

When installing equipment where access to the main power cord is restricted, such as rack mounting, a separate main input power disconnect device must be provided in close proximity to the equipment and within easy reach of the operator.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

For safety, instruments and accessories must be used in accordance with the operating instructions. If the instruments or accessories are used in a manner not specified in the operating instructions, the protection provided by the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with the same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as protective earth (safety ground) connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.



If a screw is present, connect it to protective earth (safety ground) using the wire recommended in the user documentation.



This symbol on an instrument means caution, risk of danger. The user should refer to the operating instructions located in the user documentation in all cases where the symbol is marked on the instrument.



This symbol on an instrument means caution, risk of electric shock. Use standard safety precautions to avoid personal contact with these voltages.



This symbol on an instrument shows that the surface may be hot. Avoid personal contact to prevent burns.



This symbol indicates a connection terminal to the equipment frame.



If the mercury symbol is on a product, it indicates that mercury is present in the display lamp. Please note that the lamp must be properly disposed of according to federal, state, and local laws.

WARNING This heading in the user documentation explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

CAUTION This heading in the user documentation explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits — including the power transformer, test leads, and input jacks — must be purchased from Keithley Instruments. Standard fuses with applicable national safety approvals may be used if the rating and type are the same. Other components that are not safety-related may be purchased from other suppliers as long as they are equivalent to the original component (note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product). If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, remove power from the instrument. Use a damp cloth or mild, water-based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., a data acquisition board for

installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning and servicing.

Safety precaution revision of January 2013

Power and environmental specifications

For indoor use only.

Power supply	100 V to 240 V _{RMS} , 50 Hz to 60 Hz (automatically sensed at power up)
Maximum VA	60 VA
Operating altitude	Maximum 2000 m (6562 ft) above sea level
Operating temperature	0 °C to 50 °C (32 °F to 122 °F), less than 80 % relative humidity at 35 °C (95 °F)
Storage temperature	-30 °C to +70 °C (-22 °F to 158 °F)
Pollution degree	1 or 2

Introduction

The Model DMM7510 is a 7-1/2 digit graphical sampling multimeter that expands standard digital multimeter (DMM) functions with high-speed digitizing and a large color graphical touchscreen display.

In addition to industry-leading DC accuracies, functions such as capacitance, 10 A current, and 18-bit current and voltage digitizing are included. The large 5-inch color touchscreen display ties all of these features into a package that brings you an unprecedented combination of data visualization and interaction for greater insight into your measurements.

The Model DMM7510 provides superior measurement accuracy and the speed necessary for a broad range of applications, from system applications and production testing to benchtop applications. The Model DMM7510 meets application requirements for production engineers, research and development engineers, test engineers, and scientists.

CD-ROM contents

Each Model DMM7510 instrument is shipped with a Product Information CD-ROM (part number DMM7510-950-01). The Product Information CD-ROM contains:

Quick Start Guide (this document): Provides unpacking instructions, describes basic connections, reviews basic operation information, and provides a quick test procedure to ensure the instrument is operational.

User's Manual: Provides application examples that you can use as a starting point to create your own applications.

Reference Manual: Includes advanced operation topics, maintenance information, troubleshooting procedures, and in-depth descriptions of programming commands.

KickStart Startup Software Quick Start Guide: Provides instructions for the KickStart Startup Software, which allows you to quickly make measurements and get results without having to use or program test scripts.

Accessories information: Documentation for accessories that are available for the Model DMM7510.

For the latest drivers and additional support information, see the [Keithley Instruments Website](#).

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Unpack and inspect the instrument

To unpack and inspect the instrument:

1. Inspect the box for damage.
2. Open the top of the box.
3. Remove the bag that contains the documentation, standard accessories, CD-ROM, and optional accessories.
4. Remove optional accessories (such as rack-mount hardware).
5. Remove the packaging insert.
6. Remove the Model DMM7510 from the box.



CAUTION

Do not lift the Model DMM7510 by the front bezel. Lifting the instrument by the front bezel can cause instrument damage.

7. Inspect the instrument for any obvious signs of physical damage. Report any damage to the shipping agent immediately.



You should have received the Model DMM7510 with the accessories shown in the photograph:

1. Model CA-180-3A CAT5 Crossover Cable for TSP-Link or ethernet connections
2. KKS-903-01A KickStart Quick Start Guide
3. Model DMM7510-903-01 Quick Start Guide (this document)
4. Power line cord
5. PA-853D Users Guide Safety Standards Conformance Information
6. Model DMM7510 Product Information CD-ROM
7. USB-B-1 USB Cable, Type A to Type B, 1 m (3.28 ft)
8. Model 1756 Standard Lead Kit

Refer to the packing list for additional items that may have shipped with your instrument.



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Connect the instrument

Important test system safety information

This product is sold as a stand-alone instrument that may become part of a system that could contain hazardous voltages and energy sources. It is the responsibility of the test system designer, integrator, installer, maintenance personnel, and service personnel to make sure the system is safe during use and is operating properly.

You must also realize that in many test systems, a single fault such as a software error may output hazardous signal levels, even when the system indicates that there is no hazard present.

It is important that you consider the following factors in your system design and use:

- The international safety standard IEC 61010-1 defines voltages as hazardous if they exceed $30 V_{RMS}$ and $42.4 V_{PEAK}$ or 60 V DC for equipment rated for dry locations. Keithley Instruments products are only rated for dry locations.
- Read and comply with the specifications of all instruments in the system. The overall allowed signal levels may be constrained by the lowest rated instrument in the system. For example, if you are using a 500 V power supply with a 300 V DC rated switch, the maximum allowed voltage in the system is 300 V DC.
- Make sure any test fixture connected to the system protects the operator from contact with hazardous voltages, hot surfaces, and sharp objects. Use shields, barriers, insulation, and safety interlocks to accomplish this.
- Cover the device under test (DUT) to protect the operator from flying debris in the event of a system or DUT failure.
- Double-insulate all electrical connections that an operator can touch. Double insulation ensures the operator is still protected even if one insulation layer fails. Refer to IEC 61010-1 for specific requirements.
- Make sure all connections are behind a locked cabinet door or other barrier. This protects the system operator from accidentally removing a connection by hand and exposing hazardous voltages. Use high-reliability, fail-safe interlock switches to disconnect power sources when a test fixture cover is opened.

- Where possible, use automatic handlers so operators are not required to access the DUT or other potentially hazardous areas.
- Provide training to all users of the system so they understand all potential hazards and know how to protect themselves from injury.
- During power up in many systems, the outputs may be in an unknown state until they are properly initialized. Make sure the design can tolerate this situation without causing operator injury or hardware damage.

NOTE

To keep users safe, always read and follow all safety warnings provided with each of the instruments in your system.

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Install the instrument

You can use the Model DMM7510 on a bench or in a rack. If you are installing the Model DMM7510 in a rack, please see the instructions that came with your rack-mount kit.

To prevent damaging heat build-up and ensure specified performance, make sure there is adequate ventilation and air flow around the instrument to ensure proper cooling. Do not cover the ventilation holes on the top, sides, or bottom of the instrument.

Make sure the instrument is positioned so that it is easy to reach any disconnecting devices, such as the power cord.

The Model DMM7510 operates from a line voltage of 100 V to 240 V at a frequency of 50 Hz or 60 Hz. The line voltage is sensed automatically. Before connecting line power, make sure the operating voltage in your area is compatible.



WARNING

The power cord supplied with the Model DMM7510 contains a separate protective earth (safety ground) wire for use with grounded outlets. When proper connections are made, the instrument chassis is connected to power-line ground through the ground wire in the power cord. In the event of a failure, not using a properly grounded protective earth and grounded outlet may result in personal injury or death due to electric shock.

Do not replace detachable MAINS supply cords with inadequately rated cords. Failure to use properly rated cords may result in personal injury or death due to electric shock.

The Model DMM7510 must be turned on and allowed to warm up for at least 90 minutes to achieve rated accuracies.

To connect line power and turn on the instrument:

1. Make sure the front-panel power switch is in the off (0) position.
2. Connect the socket of the supplied power cord to the power module on the rear panel.
3. Connect the plug of the power cord to a grounded AC outlet.



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Explore the Model DMM7510

Home
Go to home screen

Menu
Go to menu screen



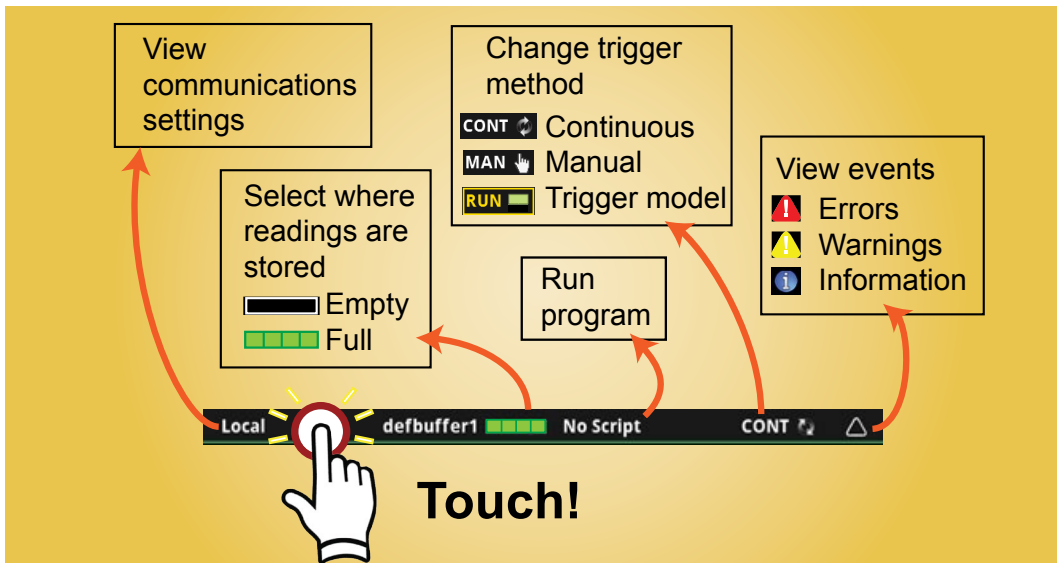
Measure functions

- DC voltage
- AC voltage
- Temperature
- Continuity
- DCV ratio
- DC current
- AC current
- Frequency
- Capacitance
- 2W resistance
- 4W resistance
- Period
- Diode

Digitize functions

- Digitize voltage
- Digitize current

Touch!



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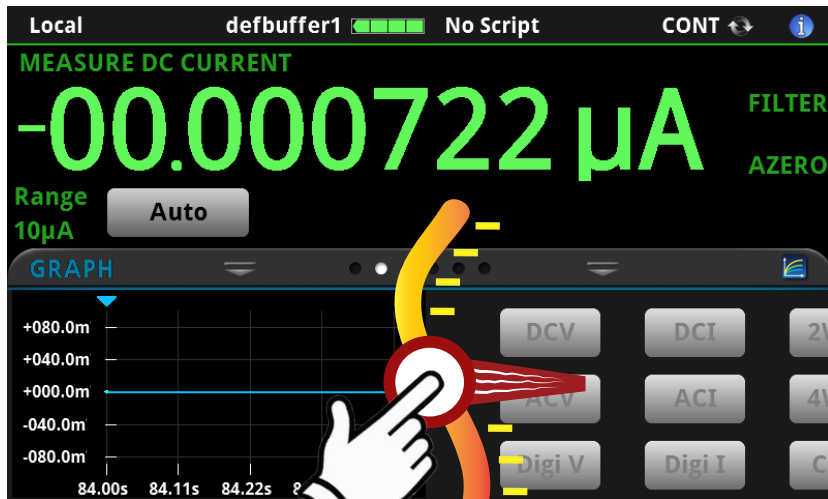
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Swipe!



Measure settings



Active measure function
Press to change

Settings for
active function

Swipe screen
↑ or ↓
for more content

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A buffer stores readings.



Where do measurements go?

defbuffer1

In the active buffer you selected

View the buffer data

MENU >



Use a default buffer or create your own

MENU >



> New

User-created buffers

defbuffer1	
Time	Measure
18/17 16:12:31.353062	+0.1621057 V
18/17 15:12:31.371256	+0.00.280396 mV
18/17 15:12:31.400958	+0.00.150288 mV
18/17 15:12:31.426225	+0.00.865115 mV
18/17 15:12:31.446668	+0.00.86234 mV

defbuffer2	
Time	Measure
15/17 15:08:32.843367	-0.00.02135 mV
15/17 15:08:31.743591	-0.00.02135 mV
15/17 15:08:32.283515	-0.00.02116 mV
15/17 15:08:32.843367	-0.00.02088 mV

myBuff1	
Time	Measure
18/17 16:12:31.353062	+0.1621057 V
18/17 15:12:31.371256	+0.00.280396 mV
18/17 15:12:31.400958	+0.00.150288 mV
18/17 15:12:31.426225	+0.00.865115 mV
18/17 15:12:31.446668	+0.00.86234 mV

test2	
Time	Measure
15/17 15:08:32.843367	-0.00.02135 mV
15/17 15:08:31.743591	-0.00.02135 mV
15/17 15:08:32.283515	-0.00.02116 mV
15/17 15:08:32.843367	-0.00.02088 mV

Default buffers

Save to USB



Stored as a .csv file

Plot data on a graph



What can you do with buffer data?

View data

	Time	Measure
1	10/20 15:32:56.5574	-0.0001259 V
2	10/20 15:32:56.5574	-000.69199 mV
3	10/20 15:32:56.5574	-000.67596 mV
4	10/20 15:32:56.5574	-000.65740 mV
5	10/20 15:32:56.5574	-000.65451 mV
6	10/20 15:32:56.5574	-000.67134 mV
7	10/20 15:32:56.5574	-000.67134 mV
8	10/20 15:32:56.5574	-000.67520 mV
9	10/20 15:32:56.5574	-000.66180 mV

Touch to display details

Reading Details	
Measure Function	Voltage DC
Reading	000.04779 mV
Math	Off
Limit 1 Low	False
Limit 1 High	False
Limit 2 Low	False
Limit 2 High	False
Terminal	Front

OK

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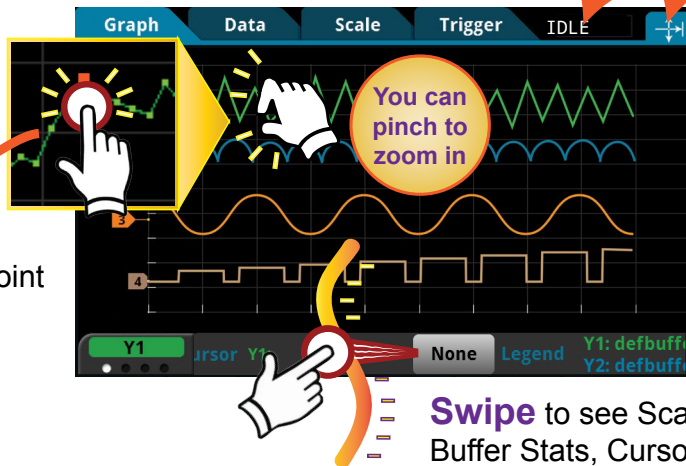
Graphing

Touch to initiate trigger model

Smart Scale
Touch to scale automatically



Touch any point to see more information



Swipe to see Scale, Buffer Stats, Cursor, and Legend

Scale

Scaling options



View all



Track Group

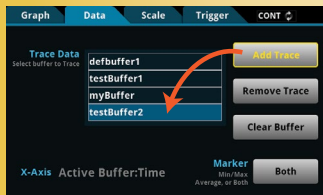


Track Latest

Smart Scale 
Picks scale for you
based on available data

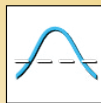
Data

Select which data to graph

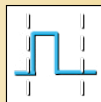


Trigger

Similar to oscilloscope triggering



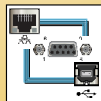
Analog Edge



Analog Pulse



Analog Window



External Digital Inputs

Getting help

- 1 Turn navigation control to change selection



- 2 Highlight the object you want help with

- 3 Press the HELP key

Connections for testing

WARNING

To prevent electric shock, test connections must be configured such that the user cannot come in contact with test leads or any device under test (DUT) that is in contact with the conductors. It is good practice to disconnect DUTs from the instrument before powering the instrument. Safe installation requires proper shields, barriers, and grounding to prevent contact with test leads.

CAUTION

Do not apply more than $1000\text{ V}_{\text{PEAK}}$ to the INPUT terminals or more than $350\text{ V}_{\text{PEAK}}$ to the SENSE terminals. Failure to heed this caution may result in instrument damage.

Do not apply more than $250\text{ V}_{\text{PEAK}}$ between INPUT LO and the AMPS input. Failure to observe this caution may result in instrument damage.

Do not apply more than 3 A, 250 V to the input. This will cause the AMPS fuse to open-circuit.

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The physical connections for the front panel are shown in the following figures. Note that you must use either the front terminals or rear terminals — you cannot mix connections. The front-panel and rear-panel connections are safety banana jacks.

The example in this guide shows you how to make connections to the front panel and short the connections.

For this example, you can make the connections with the Model 1756 Standard Test Lead Kit, which is supplied with the Model DMM7510 and the Keithley Instruments Model 8608 Safety Clip Lead Set.

1. Make sure the front panel power switch is in the off (O) position.
2. Connect the red lead to the **INPUT HI** connection.
3. Connect the black lead to the **INPUT LO** connection.



Verify measurement operation

The following steps provide a quick way to verify that the instrument is operating correctly.

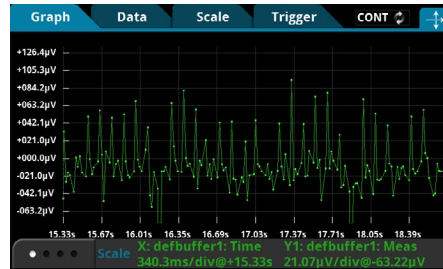
To verify measurement operation:

1. Turn the instrument on.
2. On the front panel, press the **HOME** key.
3. On the Functions swipe screen, select **DCV**.
4. Short the connections.

The voltage measurements appear in the MEASURE DC VOLTAGE area of the home screen and should read approximately 0 V.

To view the measurements on the graph screen:

1. Press the **MENU** key.
2. Under Views, select **Graph**.



You can adjust the graph settings using the options in the Data and Scale tabs.

FAQs

How do I save data to a USB flash drive?

1. Insert a USB flash drive into the front-panel USB connector.
2. Press the **MENU** key.
3. Under Measure, select **Reading Buffers**.
4. Select **defbuffer1**.
5. Select **Save To USB**.
6. Enter the file name.
7. Select **Enter** (on the screen).
8. A confirmation message is displayed. Select **Yes**.

The data is saved to a `.csv` file.

My data looks odd or is wrong. What should I do?

Verify the connections from the instrument to the test fixture. Also check the connections from the DUT to the test fixture socket.

How do I change the command set?

In addition to the front panel options, you can use a remote interface to set up the instrument. You can choose one of the following command sets:

- **SCPI:** An instrument-specific language built on the SCPI standard.
- **TSP:** A programming language that can be used to send individual commands or combine commands into scripts.

You cannot combine the command sets.

As delivered from Keithley Instruments, the Model DMM7510 is set to work with the SCPI command set.

To set the command set using the front panel:

1. Press the **MENU** key.
2. Under System, select **Settings**.
3. Select the button next to Command Set.
4. Select the command set.
5. You are prompted to reboot the instrument.

Why did my settings change?

Many of the settings in the Model DMM7510 are saved with the function that was active when you set them. For example, assume you have measure function set to current and set a value for the number of digits to display. When you change the measure function to voltage, the displayed digits value changes to the value that was last set the voltage measure function. When you return to the current measure function, the displays digits value returns to the value you set previously.

Next steps

For more information, refer to the Model DMM7510 7-1/2 Digit Multimeter Product Information CD-ROM, which includes the following documents:

- **Model DMM7510 User's Manual:** Provides application examples that you can use as a starting point to create your own applications.
- **Model DMM7510 Reference Manual:** Includes advanced operation topics, maintenance information, troubleshooting procedures, and in-depth descriptions of programming commands.
- **KickStart Startup Software Quick Start Guide:** Provides instructions for the KickStart Startup Software, which allows you to quickly make measurements and get results without having to program test scripts.
- **Accessories information:** Documentation for accessories that are available for the Model DMM7510. Also see the Keithley Instruments website, www.keithley.com for support and additional information about the instrument.

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