

Model 2450 System SourceMeter®

Quick Start Guide



Safety precautions

The following safety precautions should be observed 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 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 the 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 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 VDC 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. Maximum signal levels are defined in the specifications and operating information and shown on the instrument panels, test fixture panels, and switching cards.


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.

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

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


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

The  symbol indicates a connection terminal to the equipment frame.

If this  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.

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

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

The **CAUTION** heading with the  symbol in the user documentation explains hazards that could result in moderate or minor injury or damage the instrument. Always read the associated information very carefully before performing the indicated procedure. Damage to the instrument 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. Standard fuses with applicable national safety approvals may be used if the rating and type are the same. The detachable mains power cord provided with the instrument may only be replaced with a similarly rated power cord. 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 to maintain accuracy and functionality of the product). If you are unsure about the applicability of a replacement component, call a Keithley office for information.

Unless otherwise noted in product-specific literature, Keithley instruments are designed to operate indoors only, in the following environment: Altitude at or below 2,000 m (6,562 ft); temperature 0 °C to 50 °C (32 °F to 122 °F); and pollution degree 1 or 2.

To clean an instrument, use a cloth dampened with deionized water 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/servicing.

Safety precaution revision as of June 2017.

Power and environmental specifications

For indoor use only.

Power supply	100 V _{RMS} to 240 V _{RMS} 50 Hz to 60 Hz (autosensing)
Maximum VA	150 VA
Operating altitude	Maximum 2000 m (6562 ft) above sea level
Operating temperature	0 °C to 50 °C, 70% relative humidity up to 35 °C Derate 3% relative humidity/°C, 35 °C to 50 °C
Storage temperature	-25 °C to +65 °C, 5% to 90% relative humidity non-condensing
Pollution category	2

CAUTION

Carefully consider and configure the appropriate output-off state, source levels, and compliance levels before connecting the instrument to a device that can deliver energy. Failure to consider the output-off state, source levels, and compliance levels may result in damage to the instrument or to the device under test.

Introduction

Thank you for choosing a Keithley Instruments product. The Model 2450 System SourceMeter® instrument is a precise, low-noise instrument that combines a stable DC power supply with a repeatable, high-impedance multimeter. The design of this instrument features intuitive set up and control, enhanced signal quality and range, and better resistivity and resistance capabilities than similar products on the market.

With 0.012 percent basic accuracy at 6½-digit resolution, the 2450 delivers 59 readings per second over the IEEE-488 bus. At 4½-digit resolution, it can read up to 1359 readings per second into its internal buffer.

Complete documentation for the 2450 instrument is available for download on the Keithley web page at tek.com/keithley.

The 2450 documentation includes:

- **Quick Start Guide:** This document. It provides unpacking instructions, describes basic connections, and reviews basic operation information.
- **User's Manual:** Provides an overview of front-panel instrument operation and detailed applications that show you how to use the front panel, SCPI code, and TSP code to perform typical source and measurement tasks.
- **Reference Manual:** Provides comprehensive information about the instrument's features, operation, optimization, maintenance, troubleshooting, and programming commands.

Software for the 2450 is also available for download from the Keithley web page at tek.com/keithley. You can search for the specific software you need. Available software includes:

- **Test Script Builder:** Simplifies building test scripts for instruments enabled for Keithley's Test Script Processor TSP®.
- **KickStart Instrument Control Software:** Allows you to set up your instrument and run a test without using any programming languages.
- **IVI-COM Driver:** Works in any development environment that supports COM programming, including Microsoft® Visual Basic, Microsoft Visual C++, and National Instruments LabVIEW™.
- **Keithley I/O layer:** Manages communications between Keithley instrument drivers and software applications and the instrument.

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 documentation and accessories.
4. Remove the packaging insert.
5. Remove the 2450 from the box.

CAUTION

Do not use the front bezel to lift the 2450. Using the front bezel can cause damage to the instrument.

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

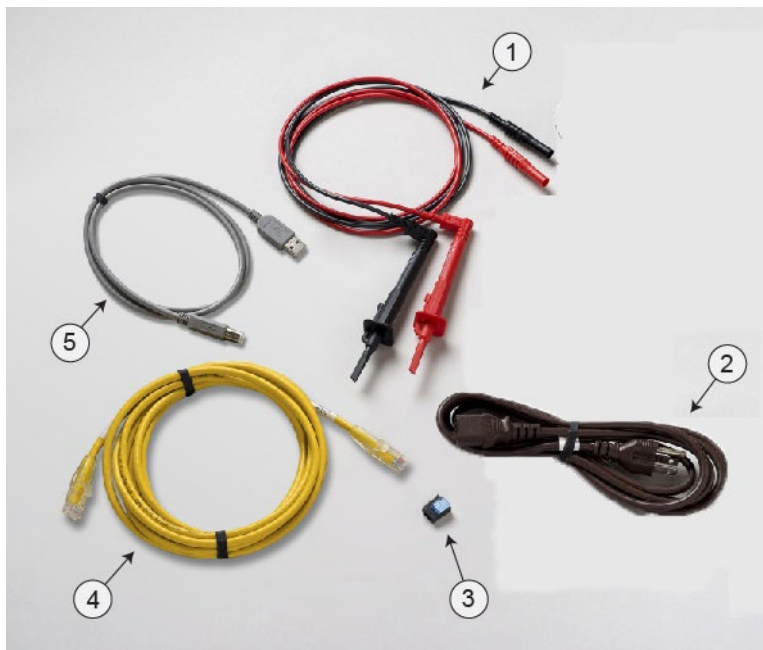


Unpack

You should have received the 2450 with the following accessories, shown in the photograph:

1. Model 8608 Safety Clip-Lead Set
2. Power line cord
3. Model CS-1616-3 Mini-clamp II Plug for the interlock
4. RJ-45 LAN crossover cable for TSP-Link or ethernet
5. USB-B-1 USB Cable, Type A to Type B (1 m)
6. Model 2450-903-01 Quick Start Guide (this document; not shown)
7. 0713411XX Safety Precautions (XX is the revision number; not shown)

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



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 VDC 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 VDC rated switch, the maximum allowed voltage in the system is 300 VDC.
- Cover the device under test (DUT) to protect the operator from flying debris in the event of a system or DUT failure.
- 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.
- 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 that operators are not required to access the DUT or other potentially hazardous areas.
- Provide training to all users of the system so that they understand all potential hazards and know how to protect themselves from injury.
- In many systems, during power up, 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.

Install the instrument

You can use the 2450 on a bench or in a rack. See the instructions that came with your rack-mount kit if you are installing the 2450 in a rack.

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.

Position the instrument so that it is easy to reach any disconnecting devices, such as the power cord and the power switch.

Wiring the interlock

WARNING

The 2450 is provided with an interlock circuit that must be positively activated in order for the high-voltage output to be enabled. The interlock helps facilitate safe operation of the equipment in a test system. Bypassing the interlock could expose the operator to hazardous voltages that could result in personal injury or death.

To perform high-voltage measurements, the 2450 interlock must be connected to an interlock switch in the testing environment. When properly connected, the safety interlock of the 2450 places the outputs of the instrument in a safe state. When the safety interlock signal is asserted, all voltage ranges of the instrument are available and the green front-panel INTERLOCK indicator is illuminated.

The action when the interlock signal is not asserted depends on the Interlock setting.

If Interlock is set to Off and the safety interlock signal is not asserted, the following occurs:

- The nominal output is limited to less than ± 42 V.
- The front-panel INTERLOCK indicator is not illuminated.
- You can output voltages less than ± 42 V.

If Interlock is set to On, when the safety interlock signal is not asserted, the following occurs:

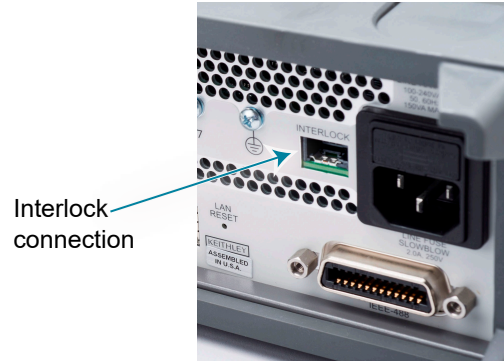
- You cannot turn on the source output for any voltage.
- The front-panel INTERLOCK indicator is not illuminated.
- Whenever the interlock changes state (from asserted to not asserted or vice versa), the output is turned off.

To change the Interlock setting:

1. From the front panel, select **MENU**.
2. Select **Source Settings**.
3. Set Interlock to **ON** or **OFF**.

If you try to assign a high-voltage output and turn the source on when the interlock is not asserted, you see event code 5074, "Output voltage limited by interlock." Note that the SOURCE swipe screen displays the value that is selected for the voltage source, but the output voltage is limited to ± 42 V.

An interlock circuit is provided on the rear panel of the instrument, as shown in the following figure. This circuit must be closed to enable the 2450 to produce voltages greater than ± 42 V.



The interlock is intended for use through a normally open switch, which may be installed on the lid of a test fixture, on the enclosure of a semiconductor prober or device handler, or on the door or doors of a test equipment rack. The circuit opens when an access door is opened and closes when the door is closed.

When the interlock is asserted, any measurement terminals, including the LO terminals, should be considered hazardous voltages, even if they are programmed to a non-hazardous voltage or current.

⚠ WARNING

Potentially hazardous voltages of up to approximately ± 210 V may be present at any measurement terminals when the interlock circuit is closed. To prevent electrical shock, do not expose these lines.

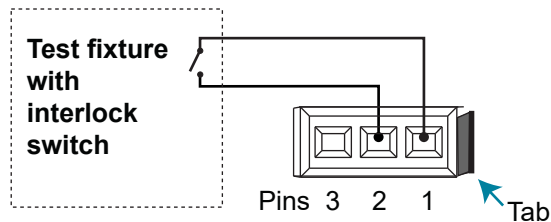
You can use the Keithley Instruments connector CS-1616-3, supplied with the 2450, to make the interlock connection to the rear panel. You must supply connection wire. The recommended wire is:

- 20 AWG to 24 AWG copper alloy
- 7 to 19 bare and tinned strands
- 0.20 mm² to 0.50 mm²
- Flexible vinyl, semi-flexible vinyl, polyethylene, x-linked polyethylene, or PTFE

To ensure proper interlock operation, the combined resistance of the external interlock switch and connection wires must be less than 10 Ω when the switch is closed.

The interlock pin locations and connections are shown in the following figure. The pins are:

- Pin 3: Earth and chassis ground
- Pin 2: Interlock
- Pin 1 (next to tab): +6 V DC out (current limited)



To assemble the interlock:

1. Insert the wire into CS-1616-3.
2. Use a pair of pliers to squeeze the connector sections together.

You cannot disassemble connector and reuse it.

Power on the instrument

The 2450 operates from a line voltage of 100 V to 240 V at 50 Hz or 60 Hz. The instrument senses the line voltage and frequency automatically. Before connecting line power, make sure the operating voltage in your area is compatible.

⚠ WARNING

The power cord supplied with the 2450 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 addition, a redundant protective earth connection is provided through a screw on the rear panel. This terminal should be connected to a known protective earth. 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.

To connect line power:

1. Make sure the front-panel power switch is in the off (O) 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.
4. Turn on the instrument by pressing the front-panel **POWER** switch to the on (I) position. The instrument starts.



Overview of the front-panel options

The front panel of the 2450 allows you to set up most instrument functions and features and perform sourcing and measuring operations. The front panel includes:

- A touchscreen display that allows you to access instrument settings and measurement readings.
- Keys that select menu options and start measurement operations.
- A navigation control that can be used to select screen options.
- An Output On/Off switch that turns the source output on or off.
- Banana jack connections for FORCE HI and LO, SENSE HI and LO, and chassis ground.
- A Terminals switch that determines if the instrument uses the front-panel or rear-panel connections for sourcing and measuring.

Touchscreen display overview

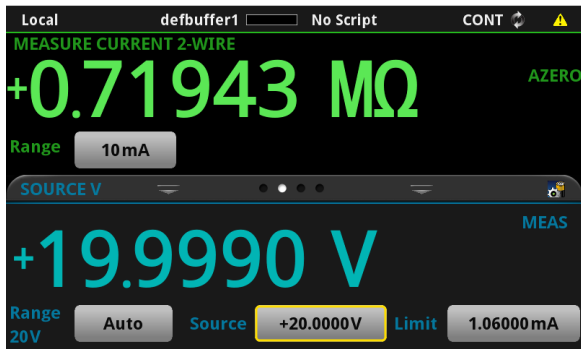
You can use the touchscreen display to set up the instrument and tests. You use the keys and touch capabilities to make selections.

To use the touchscreen, select options with your finger. You can also use the navigation control to highlight an item, and then press the control to select it.

The following text describes some of the most commonly used screens. For more detail and descriptions of all the screens, see the *Model 2450 Reference Manual*. For detail about an option, select it and press the **HELP** key to display a brief description of the option.

Home screen overview

The home screen is the first screen that opens when the instrument is powered on. You can always return to the home screen by pressing the **HOME** key.



The top row on the home screen displays the status and event indicators. You can select these options to open dialog boxes that provide additional information about the status or event.

The measure section of the home screen displays the present measurement. It also displays the measure function and allows you to select a measure range.

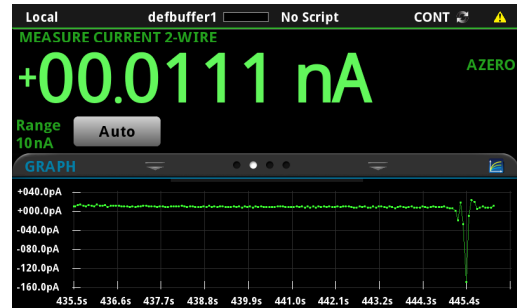
The bottom half of the touchscreen display contains multiple screens that you can swipe to access additional information and settings:

- **SOURCE** swipe screen: Displays the source settings. When the output is on, this displays either the programmed source value or the actual source, depending on the setting of source readback. On the source swipe screen, you can set the source range, source value, and source limit.
- **SETTINGS** swipe screen: Allows you to turn features on and off, such as the measurement filter, math functions, relative offset, and NPLCs.
- **GRAPH** swipe screen: Shows a graph of the readings in the presently selected buffer. Touch the graph icon on the right side of the graph swipe header to open a full-screen graph view.
- **STATISTICS** swipe screen: Contains statistics based on the readings in the active buffer.
- **USER** swipe screen: If set up (remote commands only), displays information that you can define through a remote interface.

An example of the SETTINGS swipe screen is shown below. In the SETTINGS swipe screen shown here, the Auto Zero feature is turned on. The other settings are turned off.



In the GRAPH swipe screen shown here, you can view the measurements as they occur. To see a full screen graph, touch the graph icon on the right side of the swipe screen header bar to go to the Graph screen. In the full-screen graph, you can also change the data and scale of the information that is displayed on the graph.



ENTER and EXIT keys

The **ENTER** key selects a highlighted option. In most cases, it opens a menu or dialog box that allows you to make settings for that option.

The **EXIT** key returns to the previous screen or closes a dialog box. For example, if you are in the MENU screen, press **EXIT** to return to the home screen.

TRIGGER key

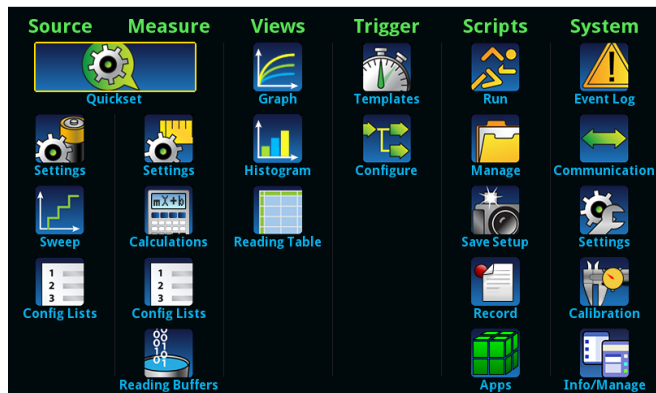
The action of the **TRIGGER** key depends on the measurement method that is selected:

- If you set the instrument to continuously trigger, this displays a dialog box that allows you to select another measurement method.
- If you set the instrument to manually trigger, pressing the **TRIGGER** key causes the instrument to make a measurement.
- If you defined a trigger model, pressing the **TRIGGER** key initiates the trigger model.

To change the measurement method, hold the TRIGGER key for three seconds to display the methods you can choose.

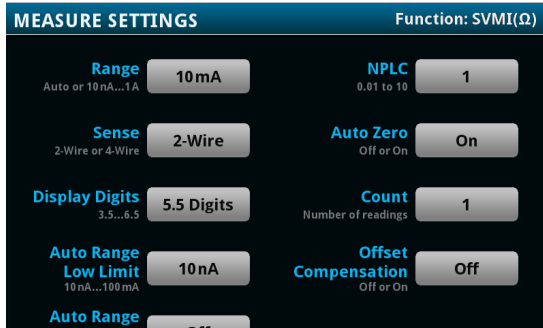
Menu screen overview

When you press the **MENU** key on the front panel, the Menu screen is displayed.



From this screen, you can select source, measure, graphing, trigger, scripting, and system setup menus. These menus allow you to choose options to set up your instrument to meet the needs of your applications.

An example of the options that are available when you select the **Settings** option under Measure is shown below.

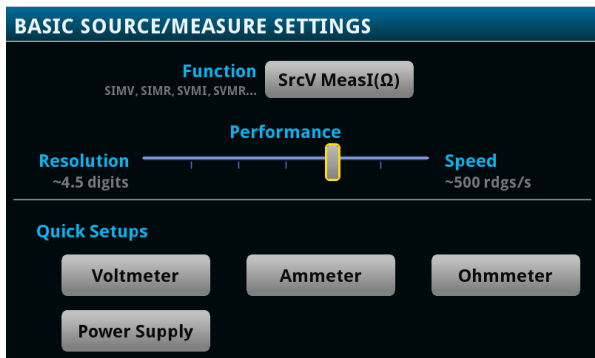


Quick Setup options

When you press **QUICKSET**, the BASIC SOURCE/ MEASURE SETTINGS screen is displayed. From this menu, you can:

- Choose the source and measure functions.
- Use the Performance slider to select the best balance between measurement resolution and measurement speed.

- Choose from a selection of Quick Setups that automatically make the settings required for that setup, turn the output on, and begin making measurements.

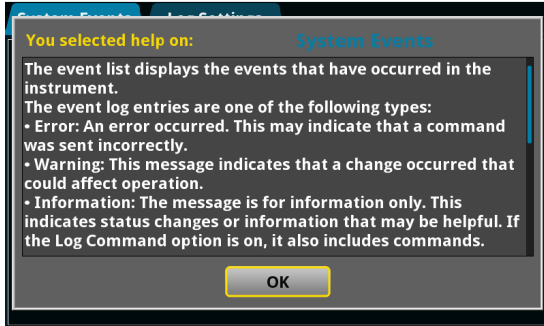


CAUTION

When you select a Quick Setup, the instrument turns the output on. Carefully consider and configure the appropriate output-off state, source, and limits before connecting the 2450 to a device that can deliver energy, such as other voltage sources, batteries, capacitors, or solar cells. Configure the settings that are recommended for the instrument before making connections to the device. Failure to consider the output-off state, source, and limits may result in damage to the instrument or to the device under test (DUT).

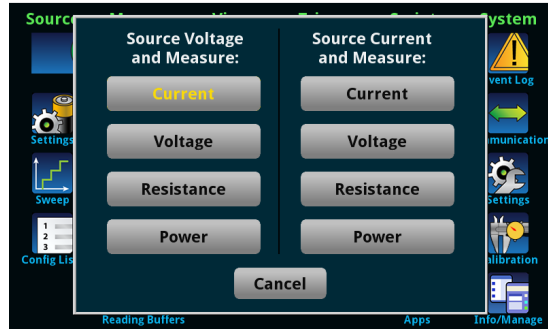
Help

You can display help screens for the menu items and buttons. The help screens give a brief description of the option that the menu or button sets. To display the description, highlight the menu item or button and press the HELP key. The graphic below shows an example of the help when you are on the System Events tab of the event log.



FUNCTION

The **FUNCTION** key opens the FUNCTION selection dialog box, which allows you to select the source and measure functions.



The instrument saves many of the settings with the source or measure function that was active when you set them. For example, if you set the measure function to current and you set a value for NPLCs, the instrument saves the NPLC value for that measure function. When you change the measure function to voltage, the NPLC value changes to the value that was last set for the voltage measure function.

Connections for testing

The following figure shows the physical connections for the front panel. Note that you must use either the front terminals or rear terminals — you cannot mix connections. The rear terminal connections are triaxial. The front-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 insulated banana cables that are supplied with the 2450, the Keithley Instruments Model 8608 High Performance Clip Leads.



To make the connections:

1. Make sure the front-panel power switch is in the off (O) position.
2. Connect the red lead to the FORCE HI connection.
3. Connect the black lead to the FORCE 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. Press the **FUNCTION** key.
4. Under Source Current and Measure, select **Voltage**.
5. Select **Source** (at the bottom of the home screen). The Current Source Value dialog box is displayed.
6. Enter **10 mA**.
7. Short the FORCE HI and FORCE LO connections.

8. Press the **OUTPUT ON/OFF** switch to enable the output and start making measurements.
9. When measurements are complete, press the **OUTPUT ON/OFF** switch to disable the output.

The voltage measurements appear in the Measure Voltage area of the home screen.

To save the data to a USB flash drive:

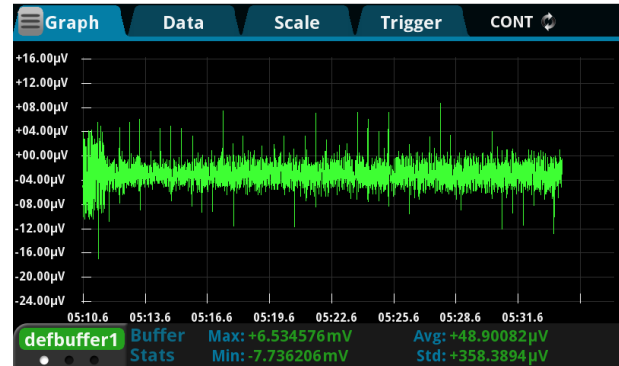
1. Insert a USB flash drive into the front-panel USB port.
2. Press the **MENU** key.
3. Under Measure, select **Reading Buffers**.
4. Select **defbuffer1**.
5. Select **Save To USB**.
6. Make file content selections.
7. Select **OK** (on the screen). A confirmation message is displayed.
8. Select **Yes**.

The instrument saves the data to a .csv file on the flash drive.

To view the measurements on the front-panel graph:

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

You can swipe and use pinch and zoom to change the view of data on the graph. You can also adjust the graph settings using the options in the Data, Scale, and Trigger tabs.



FAQs

Where can I find updated drivers or firmware?

For the latest drivers and additional support information, see the Keithley Instruments support website.

To find drivers that are available for your instrument:

1. Go to tek.com/product-support.
2. Enter **2450** and select **GO**.
3. Select **Software** on the left navigation.

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 you can use to send individual commands or combine commands into scripts.
- SCPI 2400: Allows you to run code that was developed for earlier Series 2400 instruments. If you choose this command set, you will not have access to some of the extended ranges and other features of the 2450. Refer to the *Model 2450 Reference Manual* for detail on differences between the Series 2400 instruments and operation using SCPI 2400.

You cannot combine the command sets.

As delivered from Keithley Instruments, the 2450 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. Select **OK** to reboot the instrument.

Why did my settings change?

The instrument saves many of the commands with the source or measure function that was active when you set them. For example, assume you have the measure function set to current and set a value for NPLCs. When you change the measure function to voltage, the NPLC value changes to the value that was last set for the voltage measure function. When you return to the current measure function, NPLC value returns to the value you set previously.

Next steps

For more information, refer to the Keithley Instruments website, tek.com/keithley, for support and additional information about the instrument, including the following documents:

- *Model 2450 User Manual*: Contains basic information about the instrument, plus application-based examples that help familiarize you with the instrument.
- *Model 2450 Reference Manual*: Provides detailed information about all features of the instrument, including descriptions of SCPI and TSP commands.

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