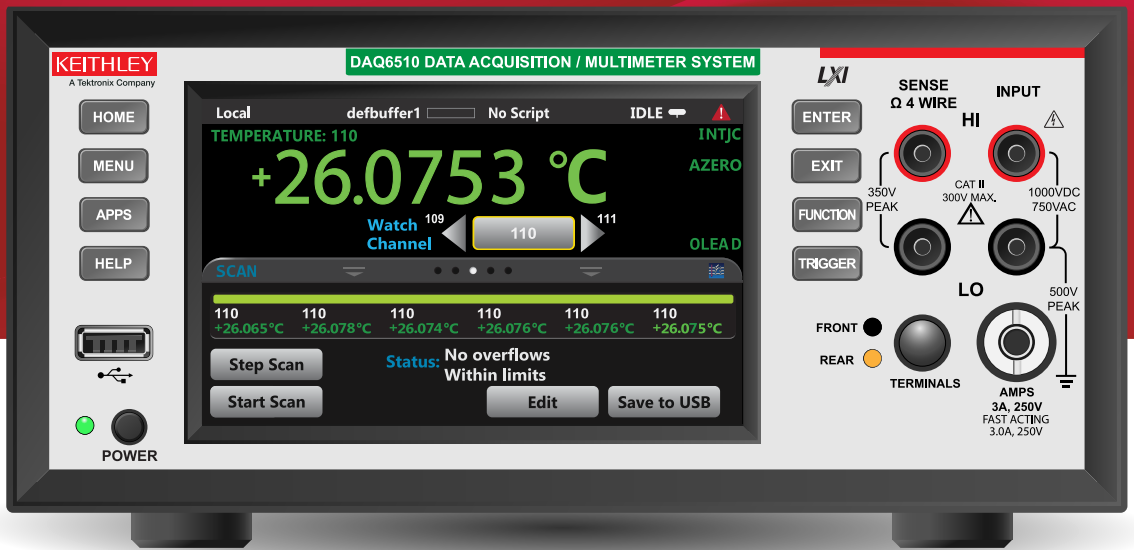
Model DAQ6510 Quick Start Guide



KEITHLEY
A Tektronix Company

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.
When fuses are used in a product, replace with the same type and rating for continued protection against fire hazard.
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.
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 (Hg) 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 precautions as of June 2018.

Power and environmental specifications

For indoor use only.

Power supply	100 V, 120 V, 220 V, and 240 V (±10%) 50 Hz to 60 Hz and 400 Hz, line frequency is automatically sensed at power-up
Maximum VA	50 VA
Operating altitude	Maximum 2000 m (6562 ft) above sea level
Operating temperature	0 °C to 50 °C, 80% relative humidity at 35 °C
Storage temperature	–40 °C to 70 °C
Pollution degree	2

Introduction

Thank you for choosing a Keithley Instruments product. The DAQ6510 is a 6½ digit graphical sampling data-acquisition system that provides high-speed digitizing and a large graphical color touchscreen display. This DAQ offers a broad range of measurement capabilities, including 15 measurement functions. In addition to industry-leading dc accuracies, functions such as capacitance and 16-bit current and voltage digitizing are included. Tying all these features together is a large 5-inch color touchscreen display that brings you an unprecedented combination of data visualization and interaction, enabling you to gain deeper insight into your measurements.

The DAQ6510 provides superior measurement accuracy and the speed necessary for a broad range of applications, from system applications and production testing to benchtop applications. The DAQ6510 meets application requirements for production engineers, research and development engineers, test engineers, and scientists.

This guide provides quick steps to set up and use the DAQ6510.

Contact information

If you have any questions after you review the information in this documentation, please contact your local Keithley Instruments office, sales partner, or distributor.

You can also call the Tektronix corporate headquarters (toll-free inside the U.S. and Canada only) at 1-800-833-9200. For worldwide contact numbers, visit tek.com/contact-tek.

Unpack and inspect the instrument

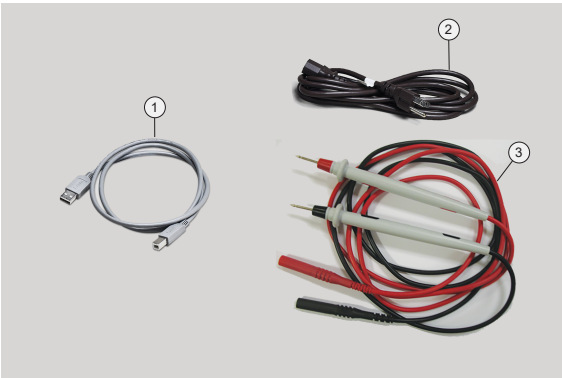
To unpack and inspect the instrument:

1. Inspect the box for damage.
2. Open the box.
3. Remove the bag that contains the documentation and standard accessories.
4. Remove the DAQ6510 from the box.
5. Remove the packaging insert.
6. Inspect the instrument for any obvious signs of physical damage. Report any damage to the shipping agent immediately.

You should have received the DAQ6510 with:

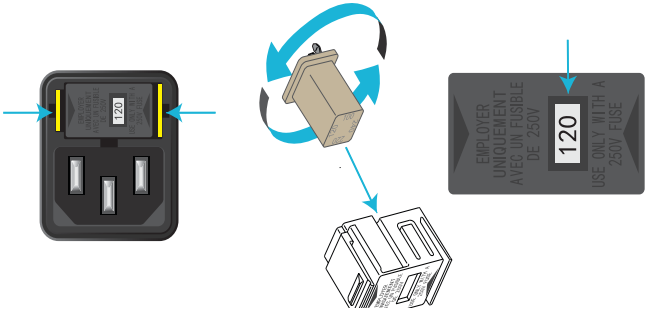
1. USB Type B cable
2. Power-line cord
3. 1757 Standard Test Lead Kit
4. Software and Documentation Downloads document and calibration certificate (not shown)

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



Check fuse settings

The fuse is set at the factory. Check the power module on the back of the instrument. The correct voltage setting should be displayed.



To change the fuse orientation:

1. Make sure the POWER is off.
2. Remove all test leads connected to the instrument.
3. Remove the power cord.
4. Squeeze the tabs on the fuse case and remove the fuse case from the power module.
5. Remove the fuse from the fuse case.
6. Rotate the fuse so the proper voltage on the fuse shows in the fuse case when installed.
7. Install the fuse case in the power module.

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.

Install the instrument

You can use the DAQ6510 on a bench or in a rack. If you are installing the DAQ6510 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 DAQ6510 operates from a line voltage of 100 V to 240 V at a frequency of 50 Hz, 60 Hz, or 400 Hz. Make sure the operating voltage in your area is compatible.

You must turn on the DAQ6510 and allow it to warm up for at least 30 minutes to achieve rated accuracies. The instrument will retain the state it was in (on or off) when it was disconnected from the power supply.

⚠ WARNING

The power cord supplied with the DAQ6510 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.

CAUTION

Operating the instrument on an incorrect line voltage may cause damage to the instrument, possibly voiding the warranty.

To connect the power cord:

1. Connect the supplied power cord to the AC receptacle on the rear panel.
2. Connect the power cord to a grounded AC outlet.

To turn a DAQ6510 on:

1. Disconnect any devices under test (DUTs) from the DAQ6510.
2. Press and hold the **POWER** switch for two seconds to turn the instrument on. The indicator next to the **POWER** switch shows amber in the off state and green in the on state when connected to the power source.

The instrument displays a status bar as the instrument powers on. The home screen is displayed when power on is complete.

To turn a DAQ6510 off:

Press and hold the front-panel **POWER** switch to turn off the instrument.

NOTE

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

Displays the home screen — HOME

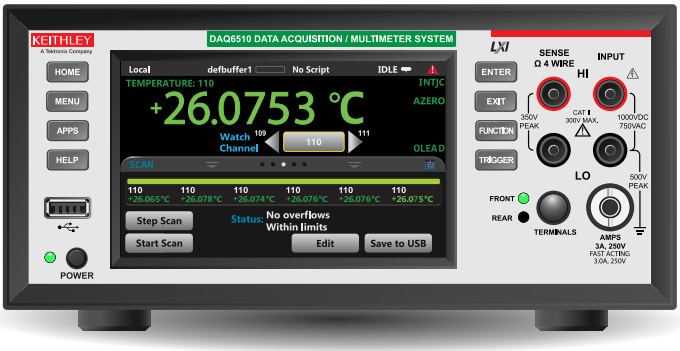
Opens the main menu — MENU

Opens the apps manager — APPS

Opens the help text for selected item — HELP

USB flash drive port

Turns instrument on or off — POWER



Sense HI and LO terminals

Input HI and LO terminals

ENTER — Selects highlighted choice

EXIT — Returns to previous screen

FUNCTION — Displays instrument function

TRIGGER — Accesses trigger settings and operations

AMPS 3A, 250V

TERMINALS — Activates front or rear terminals

Optional interface card
Optional module slot
Optional module slot
Ethernet port
MADE IN CHINA
COMMUNICATION ACCESSORY
KEITHLEY SLOT COVER
KEITHLEY SLOT COVER
EXTERNAL TRIGGER IN
EXTERNAL TRIGGER OUT
SLT 1
SLT 2
Trigger terminals
USB Type B port
Fuse module
Power module

Explore

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 V_{PEAK} to the INPUT terminals or more than 350 V_{PEAK} to the SENSE terminals. Failure to heed this caution may result in instrument damage.

Do not apply more than 500 V_{PEAK} between INPUT LO and the AMPS input. Failure to observe this caution may result in instrument damage.

To make connections:

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 1757 Standard Test Lead Kit.

To make connections:

1. Make sure the front-panel **POWER** switch is off.
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:

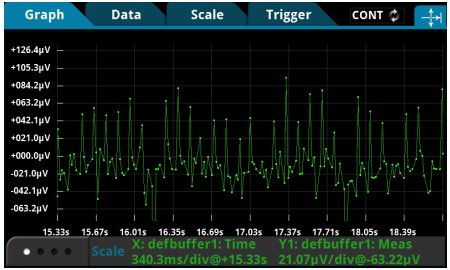
1. Turn the instrument on.
2. On the front panel, press the **HOME** key.
3. On the Functions swipe screen, select **DCV**.
4. Short the connections.

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

To view 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

Where can I find updated drivers?

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

To see what drivers are available for your instrument:

1. Go to tek.com/keithley.
2. Select **DOWNLOAD**.

What modules can be used?

MODULE	DESCRIPTION
7700	20-Channel Differential Multiplexer Module
7701	32-Channel Differential Multiplexer Module
7702	40-Channel Differential Multiplexer Module
7703	32-Channel High Speed Differential Multiplexer Module
7705	40-Channel Single-Pole Control Module
7706	20-Channel Differential Multiplexer with Automatic CJC, 16 Digital Outputs, 2 Analog Outputs, and Counter/Totalizer
7707	32-Channel Digital I/O Module with 10-Channel Differential Multiplexer
7708	40-Channel Differential Multiplexer Module with Automatic CJC
7709	6x8 Matrix Module
7710	20-Channel Solid-State Differential Multiplexer with Automatic CJC
7711	2 GHz 50 Ohm RF Module

The 7700, 7702, and 7708 modules provide two additional channels that support current measurements that use the DAQ6510 current measure functions. Refer to the switch module datasheets for the current carry specifications.

The 7705, 7711, and 7712 provide signal switching only and no direct measurement using the DAQ6510. Refer to the switch module datasheets to determine which unit is appropriate for your switching application.

Is there any software to help me get started?

Yes. KickStart and TestScript Builder can help you get started with the DAQ6510.

KickStart is a software program that allows you to set up the instrument and run a test without using any programming languages.

TestScript Builder (TSB) is a software tool that simplifies building test scripts if you are using the Test Script Processor (TSP®) scripting engine.

Both software options are available at tek.com/keithley.

FAQs and next steps

How do I change the command set?

You can change the command set that you use with the DAQ6510. The remote command sets that are available include:

- SCPI: An instrument-specific language built on the SCPI standard.
- TSP: A scripting programming language that contains instrument-specific control commands that can be executed from a stand-alone instrument. You can use TSP to send individual commands or use it to combine commands into scripts.
- SCPI2700: An instrument-specific language that allows you to run code developed for Keithley Instruments Series 2700 instruments.
- SCPI2701: An instrument-specific language that allows you to run code developed for Keithley Model 2701 instruments.

You cannot combine the command sets.

To set the command set from the front panel:

1. Press the **MENU** key.
2. Under System, select **Settings**.
3. Select the **Command Set**.
4. Reboot the instrument at the prompt.

NOTE

As delivered from Keithley Instruments, the DAQ6510 is set to work with the SCPI command set.

Why can't the DAQ6510 read my USB flash drive?

Verify that the flash drive is formatted with the FAT file system. The DAQ6510 only supports FAT drives.

In Microsoft® Windows®, you can check the file system by checking the properties of the USB flash drive.

How do I save the present state of the instrument?

You can save the settings in the instrument as a script using the front-panel menus or from a remote interface. After they are saved, you can recall the script or copy it to a USB flash drive.

From the front panel:

1. Configure the DAQ6510 to the settings that you want to save.
2. Press the **MENU** key.
3. Under Scripts, select **Save Setup**.
4. Select **Create**.
5. Use the keyboard to enter the name of the script.
6. Select the **OK** button on the displayed keyboard. The script is added to internal memory.

Why did my settings change?

Many of the commands in the DAQ6510 are saved with the measure function that was active when you set them. For example, assume you have the measure function set to current and you set a value for display digits. When you change the measure function to voltage, the display digits value changes to the value that was last set for the voltage measure function. When you return to the current measure function, the display digits value returns to the value you set previously.

How do I upgrade firmware?

Upgrade files and release notes with instructions for your instrument are available at tek.com/keithley.

Next steps

Additional information

This manual has prepared you to start using your new DAQ6510 Data Acquisition and Multimeter System for your application. For more detailed information, refer to the Keithley Instruments *Model DAQ6510 Reference Manual.*

Also see tek.com/keithley for support and additional information about the instrument. From the website, you can access:

- *The Low Level Measurements Handbook: Precision DC Current, Voltage, and Resistance Measurements*
- *Switching Handbook: A Guide to Signal Switching in Automated Test Systems*
- Application notes
- Updated drivers
- Information about related products

Your local Field Applications Engineer can help you with product selection, configuration, and usage. Check the website for contact information.

Contact information: 1-800-833-9200
For additional contacts, see **tek.com/contact-tek**

Find more valuable resources at TEK.COM.
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