ACS Software 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 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 precaution revision as of June 2017.

Safety

Introduction to ACS software

ACS is a flexible, interactive software test environment designed for device characterization, parametric test, reliability test and even simple functional tests. The software supports semiconductor characterization at the cassette, wafer, and device level, using multiple test instruments and automatic parametric testing with semiautomatic and automatic probe stations.

ACS software controls hardware on the Keithley Instruments Model 4200-SCS Semiconductor Characterization System, and supports other external instruments controlled through a GPIB, such as the Keithley Instruments Series 2600B, Model 2651A, and Model 2657A System SourceMeter instruments. It also provides a combined test-execution engine that supports Model 4200-SCS and Series 2600B group testing.

ACS can perform multisite parallel I-V testing using a Series 2600B as the primary instrument. You can have as many as 16 groups of source-measure units (SMUs) on a single GPIB card, for a total of 16 parallel test sites (contact Keithley Instruments if you need more than 16 parallel sites). Each group can support up to 64 Series 2600B instruments, or 128 channels.

ACS organizes tests in a hierarchal level that is consistent with semiconductor-wafer organization, allowing for a one-time setup when managing cassette-level tests:

- Cassette: Automate multiple wafer tests
- Wafer: Define test patterns
- Pattern: Multiple sites (nonexclusive) for each pattern
- Device: Perform one or more tests (single or multi-group)
- Subsite: Perform one or more tests on devices
- Test modules: ITM, STM, PTM, and CTM

CD-ROM contents

The CD-ROM included with your software contains:

- ACS Software
- Product documentation, including PDFs of this Quick Start Guide, Reference Manual, Programmer's Manual, ACS-2600 RTM Manual, S530 Diagnostic Manual, and Release Notes

For updated documents and additional support information, see https://www.tek.com/keithley.

NOTE
After you have installed the software, and before you begin to set up any projects or run any tests, it is recommended that you review the Release Notes. The Release Notes contain valuable information about known issues and provide guidance on how to handle issues that you may encounter. The Release Notes can be found by clicking on your Windows® Start icon > All Programs > ACS > Reference > Release Notes.

The ACS Software documentation includes:

- **Quick Start Guide**: Shows how to install software, connect hardware, and set up an instrument.
- **Reference Manual**: Provides comprehensive information about software features.
- **Programmer's Manual**: Contains programming methods, LPT programming commands and device commands.
- **ACS-2600 RTM Manual**: Contains wafer level reliability testing information used to perform a series of reliability tests to the wafer level devices.
- **S530 Diagnostic Manual**: Provides information about running S530 system diagnostics.

If you do not have Adobe Reader® to view the files, you can download a free copy at https://get.adobe.com/reader/.

Introduction

Connect instruments to a computer

You must select and configure a communications interface to use ACS. When the hardware is configured properly ACS automatically scans and finds the hardware.

Supported communication interfaces

ACS software supports the following communication interfaces:

- GPIB (general purpose interface bus)
- Ethernet (also referred to as a LAN)
- TSP-Link™ (subordinate)

NOTE

ACS can also control multiple TSP instruments as a group connected to a single GPIB or Ethernet interface. Each group uses TSP-Link to connect instruments together.

The following table indicates how instruments communicate with ACS:

Instrument Series	Platform	Communication interface
2010/2400	Desktop/laptop computer	GPIB
2600	Desktop/laptop computer or 4200	GPIB, TSP subordinate
2600B	Desktop/laptop computer or 4200	GPIB, Ethernet, TSP subordinate
4200	4200 only	Internal
3700	Desktop/laptop computer or 4200	GPIB, Ethernet, TSP subordinate
DMM7510	Desktop/laptop computer	GPIB, Ethernet
Other external instruments	Desktop/laptop computer or 4200	GPIB

Select an interface

Make sure the interface is consistent with your instrument's connection, either GPIB or Ethernet. Some instruments allow multiple communication interfaces to be enabled, however you can only communicate with one interface at a time.

NOTE

See the instrument's manual for more information on the GPIB and Ethernet communication interfaces.

Configure the interface through GPIB

ACS automatically scans the GPIB instruments during start and supports the GPIB interfaces:

* High-speed: KUSB-488A, KUSB-488B, KPCI-488LPA, NI USB-488, NI PCI-488
* Low-speed: KPCI-488LP, KUSB-488, KPCI-488

GPIB card installation

Install the GPIB card and it's associated driver prior to installing ACS. Also, make sure to enable KI-mode for the GPIB driver when you install the card.

NOTE

For more information on the installation of a GPIB card driver, refer to the GPIB manufacturer's interface documentation for installation instructions.

Check the GPIB communication

Prior to starting ACS, verify that the GPIB card and driver are installed correctly and are functioning properly. For the Keithley/CEC GPIB interfaces, you can use the following diagnostic utilities: "KI-488 Configuration Utility" and the "KI-488 Diagnostic Tool."

Connect

Connect instruments with GPIB

Use an IEEE-488 GPIB cable to connect the instruments to the GPIB bus.
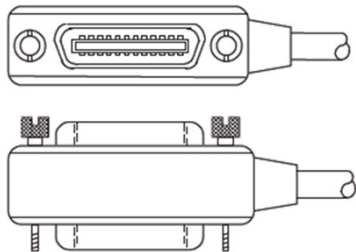
Establish the instrument's GPIB address and make sure that any additional instruments are configured for a GPIB connection and that they have a valid, unique address. For example, the Series 2600B ships from the factory with a GPIB primary address of 26.

If the GPIB interface is enabled, the instrument momentarily displays the primary address on power-up. You can set the address to a value from 0 to 30, but do not assign the same address to another instrument or to a controller on the same GPIB bus.

The next figure shows a single instrument connected to a computer with a GPIB:

GPIB Cable

ACS V5.3 system requirements

ACS software system requirements:

Minimum computer configuration

- Operating system (OS): Windows 7 x 86 (32 bit); Windows 7 x 64 (64 bit); Windows 10 x 86 (32 bit); Windows 10 x 64 (64 bit)
- CPU: 2 cores or higher; 1 gigahertz (GHz) or faster processor; or System on a chip (SoC)
- System memory (RAM): 1 gigabyte (GB) for 32 bit; 2 GB for 64 bit
- Hard disk: 16 GB for 32-bit OS; 32 GB for 64-bit OS
- Graphics card: DirectX 9 or later with WDDM 1.0 driver
- Screen: 1024 x 768, 32-bit true-color display

Recommended computer configuration

- Operating system (OS): Windows 10 x 86 (32 bit); Windows 10 x 64 (64 bit)
- CPU: 4 cores or higher; at least 2 GHz or faster processor
- System memory (RAM): 2 GB for 32 bit; 4 GB for 64 bit
- Hard disk: 32 GB for 32-bit OS; 64 GB for 64-bit OS
- Graphics card: DirectX 9 or later with WDDM 1.0 driver
- Screen: 1280 x 1024, 32-bit true-color display

Connect

Software installation

To install ACS:

1. Restart your computer.

2. Log in as an Administrator.

3. Insert the ACS setup disk into the CD-ROM drive.

4. The setup process should start automatically. If the setup does not start automatically, click on **Computer** and open the CD-ROM device folder.

5. Click the drivers folder, then click on the ACSx.x file to start the process.

6. Once the wizard dialog box opens, follow the instructions to specify how you would like the software to be installed on your system.

License information

Once the installation process is complete, the Temp License Generation dialog box opens (note that if you already have a USB license key, described in the next section, select "**Do not generate license, keep in demo mode**" in order to continue installation):
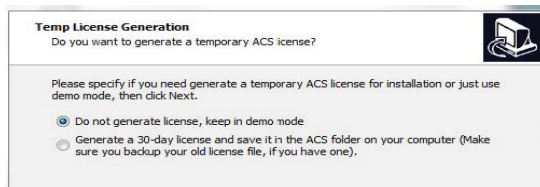
USB license key

The ACS SafeNet Sentinel USB license key, included with the ACS software package, is similar to a standard USB flash drive. The USB license key allows you to operate ACS in either professional mode or evaluation mode, and can be moved from one computer to another (multiple installations) without buying additional licenses.


If you do not have a USB license key inserted when you open the software, you will see a dialog box asking if you want to open ACS in demo mode. In demo mode communication with test and measurement hardware is disabled.

NOTE

The temporary key provides an evaluation license that you can use for 30 days.

Before running the ACS software, insert the USB license key into the computer's USB interface. ACS software will automatically detect the USB key.

If you have the temporary key, ACS will start in the evaluation mode, which has the same functionality as professional mode. The status of the temporary license key and the amount of days that you have available are displayed in the title bar:

Installation
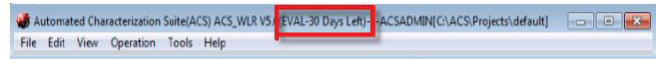
Start ACS

Make sure the instruments are connected with a GPIB/LAN cable. If more than one Series 2600B SourceMeter instrument is used, make sure that the TSP-Link connection has been made correctly. Assign GPIB addresses and node numbers. Make sure that all the instruments are turned on and self-testing is completed on all of the instruments then start ACS.

CAUTION

POSSIBLE ERROR - To avoid errors to instruments, never start ACS software until all instruments have started and completed self-testing.

Click the ACS icon (either a desktop icon or a quick launch icon chosen at installation). The User Login opens. The default User Name is ACSADMIN. There is no default password. Click OK to log in to professional mode (license key required).

Hardware configuration

The Configure Hardware function is used to get information while scanning the hardware instruments and to modify configurable instrument properties.

ACS automatically scans the instruments when you open the software. To check if the instruments are properly configured and connected, click the Configure Hardware option from the Tools menu or click the Configure Hardware icon on the toolbar:

To scan the hardware manually, click the Scan Hardware icon on the toolbar.

The hardware configuration utility interface has two panels (see next page):

*   Left panel is the configuration navigator
*   Right panel is the work area

The configuration navigator provides a tree view of the currently connected instruments and equipment. The tree branches can be expanded and minimized by clicking on the arrows to the left of each branch.

Installation

The work area shows each instrument in the system configuration and its associated properties. Click an instrument in the configuration navigator and the properties associated with the instrument display in the work area.

For more information about setting up a test, refer to the ACS Reference Manual that is on the Product Information CD-ROM.

NOTE

To exit the hardware configuration and go back to Test Setup, click the Test Setup icon on the toolbar.

FAQs

What happens if I remove my USB license key while using ACS software?

DO NOT remove the USB key from the computer while using the software in professional or evaluation mode. If removed, you will receive a warning message that indicates you have 30 seconds to re-insert the key.

Once re-inserted, click Continue. If not inserted before time has elapsed, the software will close and all data will be lost.

I just connected an instrument to my computer, but I can't select the instrument in ACS. If you make changes to the hardware, do the following:

1. Click the Configure Hardware icon.
2. Click the Scan Hardware icon in the toolbar to re-scan the hardware.
3. Click the Save function to update the changes.
4. Close and restart ACS for the changes to take effect.
5. Check the test setup to ensure the new hardware configuration is correct.

Next steps

Refer to the ACS Manuals:

Reference Manual: provides comprehensive information about ACS.

Programmer's Manual: programming methods, LPT and device library commands.

ACS-2600 RTM Manual: wafer level reliability testing used to perform reliability tests to wafer level devices.

S530 Diagnostic Manual: information about the S530 system diagnostics and how to interpret the results.

The manuals are on the Product Information CD-ROM that came with your order.

Keithley Instruments website

See https//www.tek.com/keithley for support and additional information about ACS software.

FAQs and next steps

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