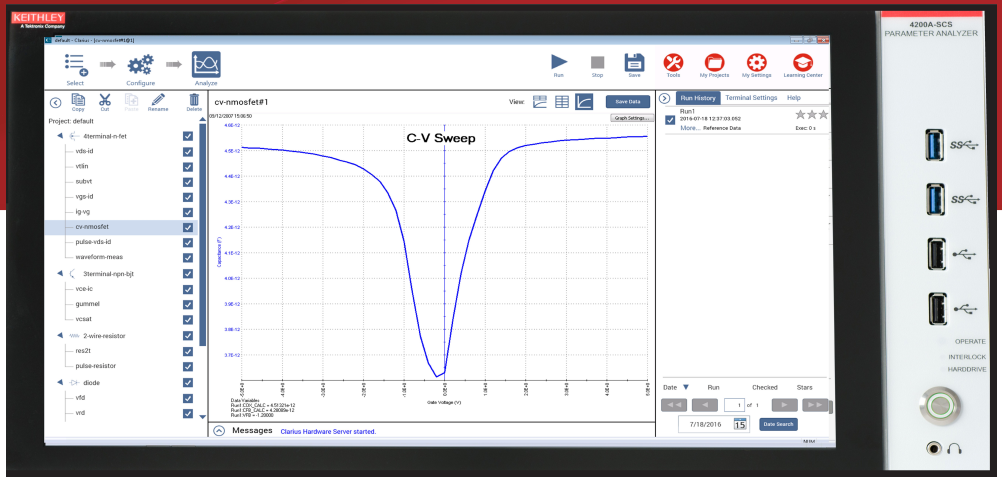
Model 4200A-SCS-PKB
High Resolution I-V & C-V Parameter Analyzer
Quick Start Guide



KEITHLEY
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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

Power and environmental ratings

For indoor use only.

Power supply	100 V ac to 240 V ac, 50 Hz to 60 Hz
Maximum VA	1000 VA
Operating altitude	Maximum 2000 m (6562 ft) above sea level
Operating temperature	+10 °C to +40 °C (50 °F to 104 °F), 5% to 80% relative humidity, non-condensing
Storage temperature	−15 °C to 60 °C (5 °F to 140 °F), 5% to 90% relative humidity, non-condensing

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

The 4200A-SCS and embedded Clarius software provides clear, uncompromised measurement and analysis. The Clarius software is furnished with embedded measurement expertise and ready-to-use applications that enable you to perform your research with speed and confidence. The 4200A-SCS has nine built-in projects for current-voltage (I-V), capacitance-voltage (C-V), and ultra-fast pulsed I-V characterization. The Clarius user interface provides touch-and-swipe or point-and-click control for advanced test definition, parameter analysis, graphing, and automation capabilities for modern semiconductor, materials, and process characterization.

For additional support information, see tek.com/keithley.

The 4200A-SCS documentation includes:

- **Quick Start Guide:** This document. It provides unpacking instructions, describes basic connections, reviews basic operation information, and provides a quick test procedure to ensure the instrument is operational.
- **Clarius Manual:** Provides comprehensive information about projects, tests, data analyzation, formulator data calculation, user library descriptions, customizing Clarius.
- **Hardware manuals** for setup and maintenance, source-measure units (SMUs), capacitance-voltage units (CVUs), pulse-measure units (PMUs), pulse-generator units (PGUs), and prober and external instrument control.
- **Programming guides** for the library LPT, Keithley User Library Tool (KULT) and Keithley External Control Interface (KXCI).

For complete documentation for the 4200A-SCS, see the *4200A-SCS Learning Center*. Note that the Learning Center contains instructional videos, PDFs and HTML content. To access the Learning Center, click Help in the Clarius menu, press F1 while using Clarius, or select the desktop icon.

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, optional accessories and packaging insert.
4. Carefully lift the instrument out of the box.
5. Inspect the instrument for any obvious signs of physical damage. Report any damage to the shipping agent immediately.

CAUTION

The 4200A-SCS weighs approximately 27 kilograms (60 lb) and requires a two-person lift. Do not lift the 4200A-SCS using the front bezel.

In the 4200A-SCS-PKB bundle, you should have received the 4200A-SCS Parameter Analyzer with:

- Keyboard
- Mouse
- Power line cord
- 236-ILC-3 safety interlock cable
- 4201-SMU medium-power source-measure unit (two)
- 4215-CVU high-resolution capacitance-voltage unit

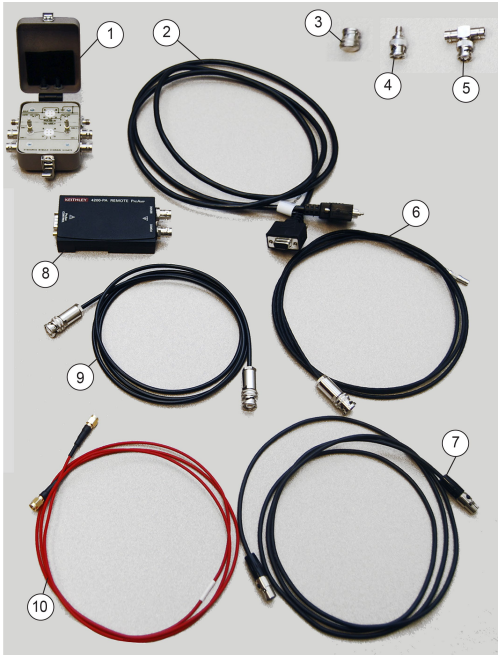
Also, you should have received the following accessories:

1 8101-PIV component test fixture with sample devices
2 4200-RPC-2 remote preamplifier cable
3 CAP-31 protective caps with triaxial connectors (two)
4 CS-1247 SMA female-to-BNC male adapters (four)
5 CS-701 BNC tee adpaters (two)
6 4200-MTRX ultra-low noise SMU triaxial cables (two)
7 236-ILC-3 safety interlock cable
8 4200-PA remote preamplifier
9 4200-TRX ultra-low noise triaxial cables (two)
10 CA-447A SMA cables, male-to-male (four)

4200A-SCS-PKB Quick Start Guide (not shown; this document)

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

Items shipped may vary from items pictured here.



Connect the instrument

Important test system safety information

This system contains instruments that can produce hazardous voltages. It is the responsibility of the test system 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.
- 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

The 4200A-SCS can be used on a bench or in a rack. See the instructions that came with your rack-mount kit if you are installing the 4200A-SCS in a rack.

Wiring the interlock

If you need voltages greater than ±40 V for testing, you must add an interlock switch to the fixture. This ensures that hazardous voltages are not present when the exterior enclosure of the fixture is open. It also enables the 4200A-SCS to output higher voltages when the exterior enclosure of the fixture is closed.

When the safety interlock signal is asserted (the switch is closed and the signal is connected to +12 V), all the voltage ranges of the SMUs are functional. When the safety interlock signal is not asserted (the switch is open), the 200 V range on the SMUs is disabled, limiting the nominal output to ±40 V.

If you need voltages greater than ±40 V, you must also connect the exterior of the test fixture enclosure to protective earth (safety ground). Take care to ensure that the wiring (FORCE, GUARD, and SENSE) in the fixture does not electrically contact the exterior of the enclosure.

WARNING

The 4200A-SCS is provided with an interlock circuit that must be positively activated for the high-voltage output to be enabled. The interlock facilitates safe operation of the equipment in a test system. Bypassing the interlock could expose the operator to hazardous voltage that could result in personal injury or death. Asserting the interlock allows the SMU and preamplifier terminals to become hazardous, exposing the user to possible electrical shock that could result in personal injury or death. SMU and preamplifier terminals should be considered hazardous even if the outputs are programmed to be low voltage. Precautions must be taken to prevent a shock hazard by surrounding the test device and any unprotected leads (wiring) with double insulation for 250 V, Category 0.

There are low-voltage and high-voltage test fixtures for the 4200A-SCS. Low-voltage fixtures, such as the 8101-PIV that is included with this bundle, are intended for applications that are less than ±40 V. For these applications, an interlock is not needed.

High-voltage test fixtures can be used with applications that are greater than ±40 V. The test fixture has a safety interlock switch connected to its lid. When the lid is closed, the interlock circuit is closed (asserted), and SMU ±200 V ranges are enabled.

Conversely, the interlock circuit is open (de-asserted) when the lid is open, and the SMU ±200 V ranges are disabled. High-voltage test fixtures require extra precaution to ensure there are no shock hazards.

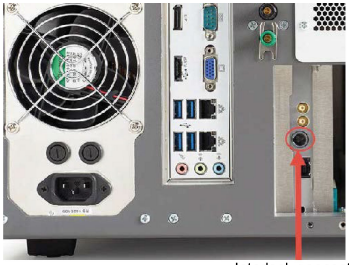
For correct operation with the 4200A-SCS, the test fixture should have a normally open switch that is used for the interlock. An open interlock condition occurs when the switch is open.

NOTE

For the examples shown in this quick start guide, you do not need to use an interlock.
The 4200A-SCS functions on all current ranges and up to up to ±40 V without asserting the interlock. When the interlock is not asserted, the maximum voltage on the SMU and preamplifier terminals is not hazardous.

To connect the interlock cable:

1. Connect one end of the supplied interlock cable (part number 236-ILC-3) to the rear panel of the 4200A-SCS. The location of the rear-panel interlock connector is shown in the following graphic.



Interlock connector

2. Connect the other end of the connector to the test fixture.

Test connections

If you are testing discrete devices, you need a test fixture that is equipped with 3-lug triaxial connectors. The 8101-PIV test fixture that is included with the 4200A-SCS-PKB allows the 4200A-SCS to be connected to a discrete device.

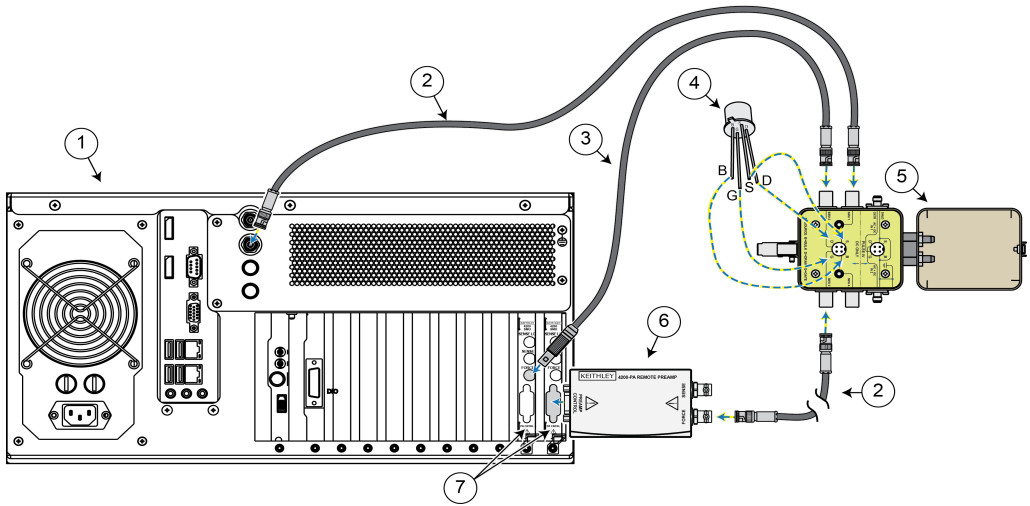
For connections to a probe station for wafer testing, see the 4200A-SCS Learning Center .

NOTE

The outer shield of the triaxial cables connects the 8101-PIV to the 4200A chassis, which connects to common.

Connect a test fixture and DUT to the 4200A-SCS

If you are using the supplied test fixture, connect the MOSFET and test fixture as shown in this diagram.



Item	Description	Qty	Notes
1	4200A-SCS Parameter Analyzer	1	
2	4200-TRX Ultra-Low Noise Preamplifier Triaxial Cables	2	Triaxial-to-triaxial cable that connects 4200-PA to a test fixture
3	4200-MTRX	1	Ultra-low noise SMU triaxial cable (mini-triaxial, connects 4201-SMU units to a test fixture)
4	TG-439 nMOSFET (DUT)	1	Plug into the test socket that is labeled DC ONLY
5	8101-PIV Component Test Fixture	1	With sample devices
6	4200-PA Remote Preamplifier	1	
7	4201-SMUs	2	

Power on the 4200A-SCS

The 4200A-SCS operates from a line voltage of 100 V to 240 V at a frequency of 50 Hz or 60 Hz. Make sure the operating voltage in your area is compatible.

CAUTION

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

WARNING

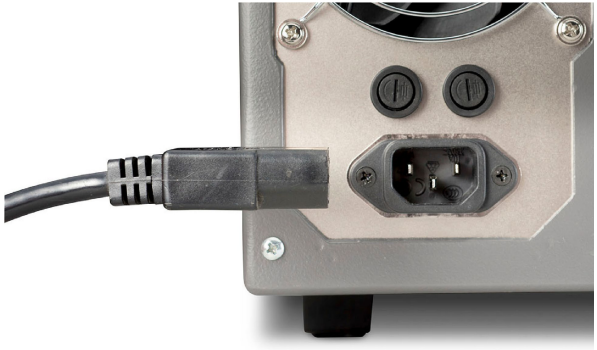
The power cord supplied with the Model 4200A-SCS contains a separate protective earth (safety ground) wire for use with grounded outlets. When proper connections are made, the instrument chassis is connected to power-line ground through the ground wire in the power cord. In addition, a redundant protective earth connection is provided through a screw on the rear panel. This terminal should be connected to 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 power on the 4200A-SCS:

1. Make sure the power is off. The power switch, on the front panel in the lower right corner, is not lit when power is off.
2. Plug the male end of the line cord into a properly grounded ac line power receptacle.
3. Turn on the 4200A-SCS by pushing the power switch. The switch is lit when power is on.

The instrument starts up.



NOTE

When first starting a Clarius+ application, you must answer “Yes” to an on-screen license agreement. Answering “No” makes your system nonfunctional until you reinstall the software.

Change powerline frequency

NOTE

The default powerline frequency is set to 60 Hz. If the setting is wrong, the 4200A-SCS cannot properly reject the powerline measurement noise.

To change powerline frequency:

1. Close Clarius.
2. Run KCon.
3. Select **KI 4200A SCS** in the Configuration Navigator. The left pane is the Configuration Navigator.
4. Change the Powerline Frequency as needed.
5. Select **Save**

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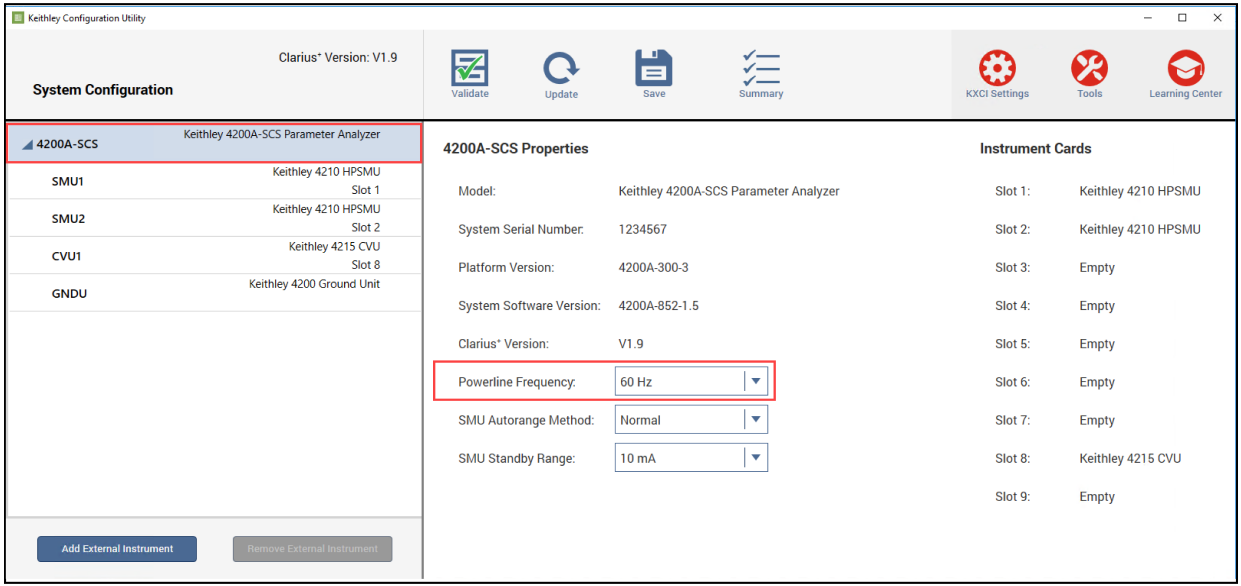
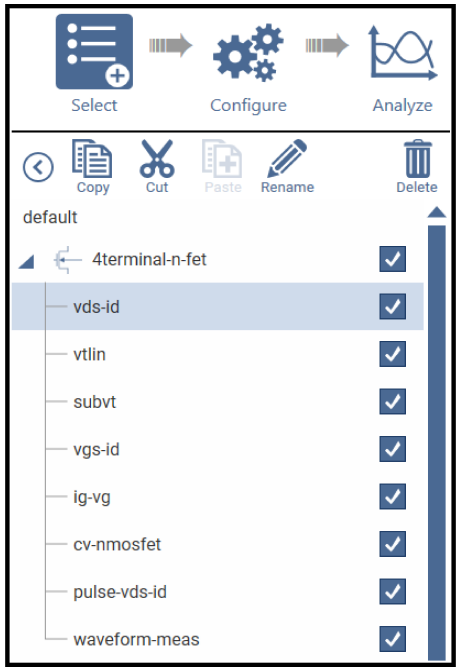

Keithley Configuration Utility
System Configuration
Clarius* Version: V1.9
Validate
Update
Save
Summary
KXCI Settings
Tools
Learning Center
4200A-SCS
Keithley 4200A-SCS Parameter Analyzer
SMU1
Keithley 4210 HPSMU
Slot 1
SMU2
Keithley 4210 HPSMU
Slot 2
CVU1
Keithley 4215 CVU
Slot 8
GNDU
Keithley 4200 Ground Unit
Add External Instrument
Remove External Instrument
4200A-SCS Properties
Model:
Keithley 4200A-SCS Parameter Analyzer
System Serial Number:
1234567
Platform Version:
4200A-300-3
System Software Version:
4200A-852-1.5
Clarius* Version:
V1.9
Powerline Frequency:
60 Hz
SMU Autorange Method:
Normal
SMU Standby Range:
10 mA
Instrument Cards
Slot 1:
Keithley 4210 HPSMU
Slot 2:
Keithley 4210 HPSMU
Slot 3:
Empty
Slot 4:
Empty
Slot 5:
Empty
Slot 6:
Empty
Slot 7:
Empty
Slot 8:
Keithley 4215 CVU
Slot 9:
Empty

Perform an I-V test on a MOSFET

The first time Clarius opens, the project tree is displayed and the `default` project is loaded. The next graphic shows the tests in this project.

To work with a test:

1. Select `vds-id` (located under `4terminal-n-fet`).



To configure the test:

1. Select **Configure** to open the pane shown here. This is where you define the test.
2. The `vds-id` settings should be:
   - SMU3: Provide a voltage step function for four different gate voltages (2 V, 3 V, 4 V ,and 5 V).
   - SMU2: Perform a 51-point sweep of drain voltage (0 V to 5 V) at each gate voltage. A current measurement is made at each voltage sweep point.
3. Change the settings as needed.
4. Select **Save**

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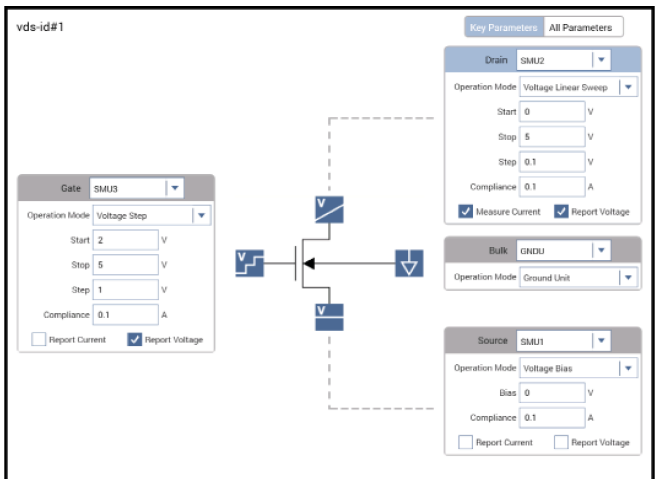
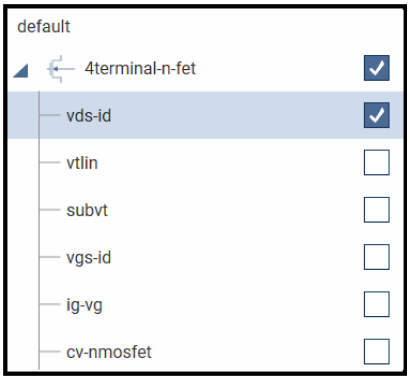


Run the vds-id test

Clarius can run a single test or a sequence of tests.

To run a single test, check the test and select it in the project tree. The test should be highlighted. When you select ▶, only that test will run. For example, in the following graphic, when you select ▶, only the `vds-id` test will run.



In the following example, one test is run.

To run the vds-id test:

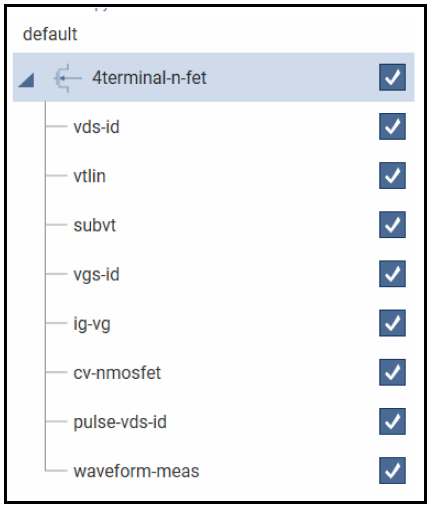
1. In the project tree, select `vds-id` to highlight it.
2. On the toolbar, select ▶.

When the test is running, Run shows two arrows circling the icon and Stop turns red:

When the test is complete, Run and Stop return to normal:

To run a sequence of tests, check the tests you want to run, then check and select the device, subsite, or project item that contains the tests.

For example, in the following graphic, when you click ▶, all the checked tests under `4terminal-n-fet` run.

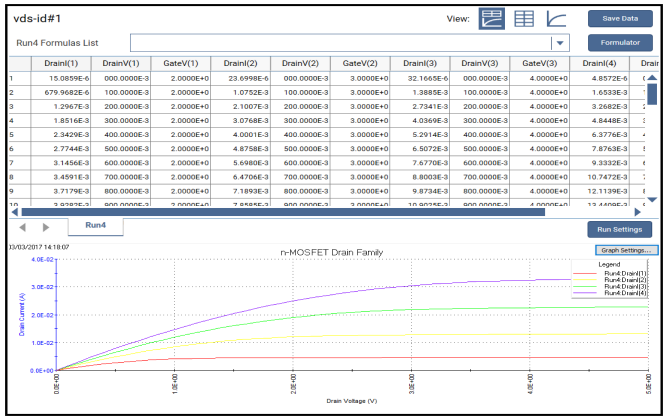


View the vds-id test results

To view `vds-id` test data, you can use the Analyze sheet, which is similar to a Microsoft Excel spreadsheet, and the graph.

To view vds-id test results:

1. Select **Analyze**.
2. Select an icon next to **View** to choose the type of information you would like to see:
   - Data and graph
   - Data only
   - Graph only

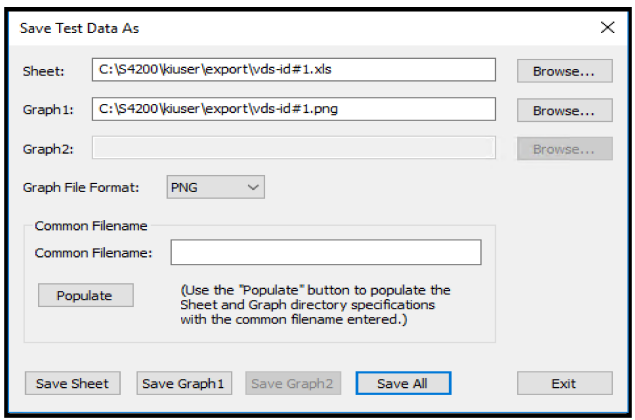


Export data or graphs

Test results are automatically saved in Clarius. You can also choose to save the data, graph, or both to an external file.

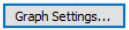
To save your test data:

1. Select **Save Data**.
2. On the **Save Test Data As** dialog box, select one of the following buttons:
   - **Save Sheet**: Select this to save only the sheet.
   - **Save Graph1**: Save only Graph1.
   - **Save Graph2** (if available): Save only Graph2.
   - **Save All**: Save the sheet and graphs.



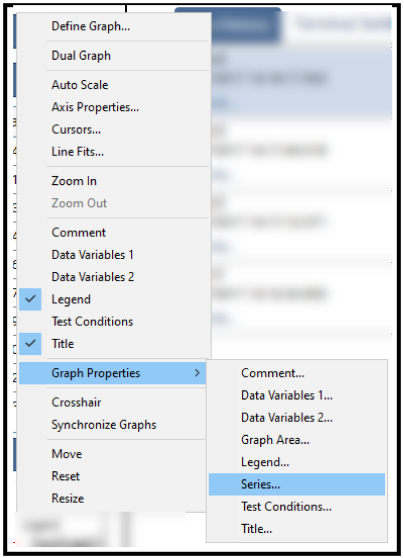
Customize the graph

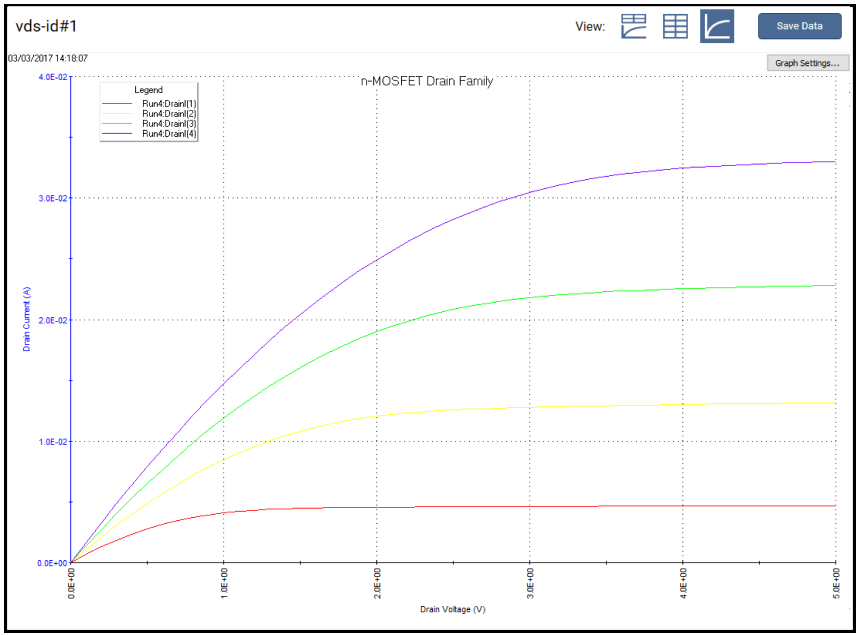
The graph shown below was customized to include the Legend box and Title and to use different colors for the graph series. These options are available through the Graph Settings button.



To customize a graph:

1. Select **Graph Settings**.
2. To include a Legend and Title, select those options from the Graph Settings menu.
3. To use different colors for the graph series, select **Graph Properties**, then select **Series**. The Data Series Properties dialog box is displayed.
4. Select the colors for each series of data.
5. Click **OK**. The series are displayed in the selected colors.

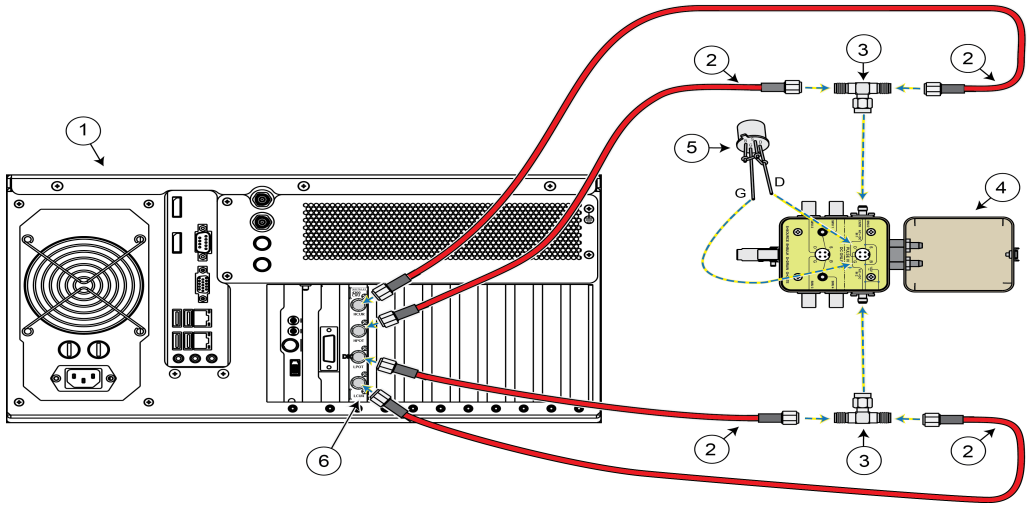



vds-id#1
View:
Save Data
03/03/2017 14:18:07
Graph Settings...
n-MOSFET Drain Family
Legend
Run4:DrainI(1)
Run4:DrainI(2)
Run4:DrainI(3)
Run4:DrainI(4)
Drain Current (A)
4.0E-02
3.0E-02
2.0E-02
1.0E-02
0.0E+00
0.0E+00
1.0E+00
2.0E+00
3.0E+00
4.0E+00
5.0E+00
Drain Voltage (V)

I-V Test

Make connections for the C-V test

If you are using the supplied test fixture, connect the nMOSFET and test fixture as shown in this diagram.

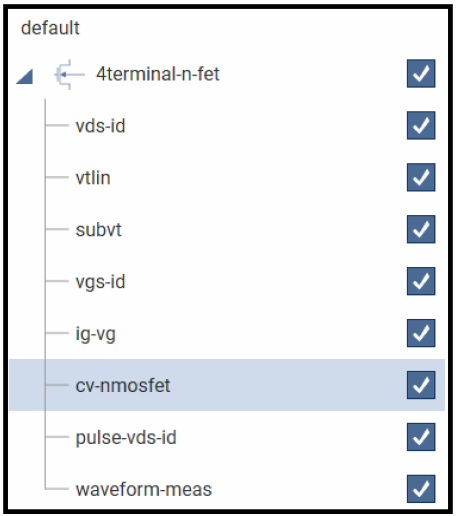


Item	Description	Qty	Notes
1	4200A-SCS Parameter Analyzer	1	
2	CA-447A cables	4	SMA cable, male-to-male, 100 Ω, 1.5 m
3	CS-1391 tee adapters	2	SMA tee adapter (female-male-female)
4	8101-PIV Component Test Fixture	1	
5	8101-309 (nMOSFET with S D B connected together (DUT))	1	Plug into PULSE IV test socket
6	4215-CVU	1	

Perform a C-V test on an nMOSFET

To perform a test:

1. In the project tree, select `cv-nmosfet`. This test is located under the `4terminal-n-fet` device.



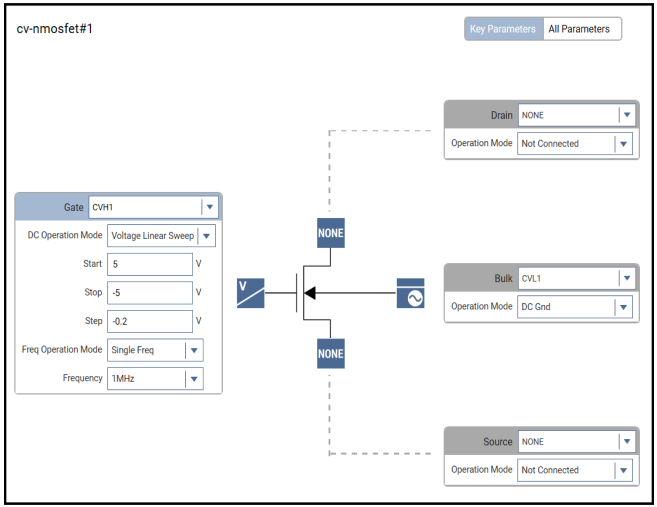
In the Configure pane, on the next page, is where you define the test. In the test shown, the device is connected to the CVH1 and CVL1 terminals on the 4215-CVU.

In the following graphic, note that the Gate is CVH1 and Bulk is CVL1.

To define the test:

1. Select **Configure**. The `cv-nmosfet` settings should be:
   - CVH1: Default setting, which is Voltage Linear Sweep, is swept from 5 V to −5 V in −0.2 V steps with a 1 MHz capacitance measurement made at each step.
   - CVL1: Default setting, which is DC Gnd.
2. Change the settings as needed.
3. Select **Save**

.



Run the cv-nmosfet test

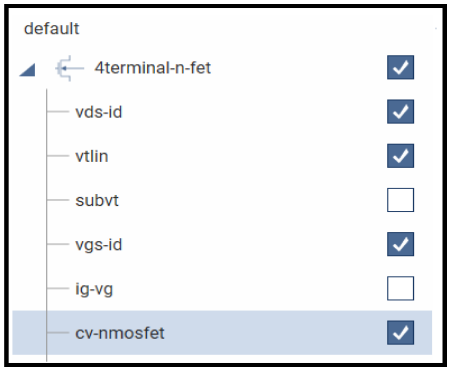
In the following example, only one test is run.

To run the cv-nmosfet test:

1. In the project tree, select `cv-nmosfet` to highlight it.
2. On the toolbar, select ▶ .

When the test is running, Run shows two arrows circling the icon and Stop turns red:

When the test is complete, Run and Stop return to normal:

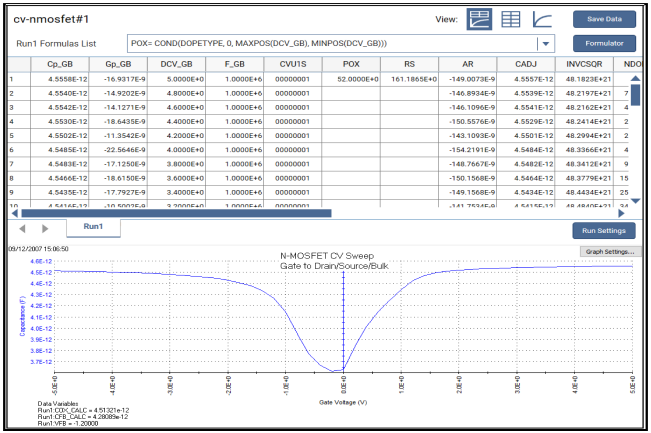


View the cv-nmosfet test results

To view `cv-nmosfet` test data, you can use the Analyze sheet, which is similar to a Microsoft Excel spreadsheet, or the graph.

To view cv-nmosfet test results:

1. Select **Analyze**.
2. Select an icon next to **View** to choose the type of information you would like to see:
   - Data and graph
   - Data only
   - Graph only

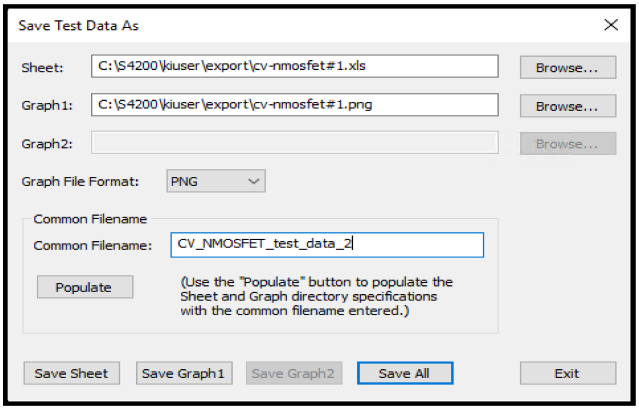


Export data or graphs

Test results are automatically saved in Clarius. You can also choose to save the data, graph, or both to an external file.

To save your test data:

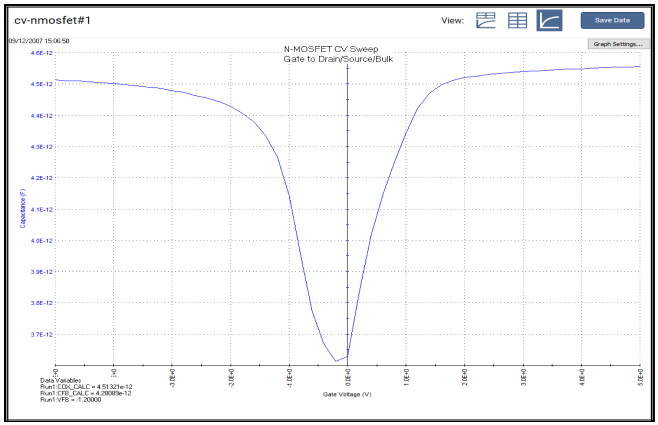
1. Select **Save Data**.
2. If you are saving a graph, select the **Graph File Format**.
3. On the **Save Test Data As** dialog box, select one of the following buttons:
   - **Save Sheet**: Save only the sheet.
   - **Save Graph1**: Save only Graph1.
   - **Save Graph2** (if available): Save only Graph2.
   - **Save All**: Save the sheet and graphs.



To display the graph for the `cv-nmosfet` test, select **Graph only**.

A sample graph is shown here. In this example, the C-V curve is measured between the gate and the source/drain/bulk. Notice that the COX, CFB, and VFB parameters are extracted and displayed on the screen.

You can customize graphs with options that are available through the Graph Settings button.



C-V Test

FAQs

How should I clean the front-panel display?

If you need to clean the front-panel LCD touchscreen display, use a soft dry cloth. If necessary, moisten a microfiber cloth with distilled water or diluted isopropyl alcohol and gently wipe the display. Do not spray or apply fluids directly to the LCD display. Additionally, it is strongly recommended that you use only fingers on the touchscreen. Do not use sharp objects, such as a pen or pencil, to touch the touchscreen.

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.

I cannot unplug the mini-triaxial cable (4200A-MTRX) from the SMU. What should I do?

The mini-triaxial connector is a locking connector. To remove it, pull the knurled part of the connector back.

A configuration error has been detected and I cannot launch Clarius. What should I do?

This occurs when the physical configuration does not match the configuration defined in KCon or when there are communication problems between instruments and the 4200A-SCS.

To verify system configuration:

1. Run KCon.
2. Select **Validate**.

To update the system configuration:

1. Run KCon.
2. Select **Update**.

This can occur if the preamplifier or RPM is removed or reconnected. Note that preamplifiers are SMU specific. For example, a preamplifier that is configured for SMU1 cannot be connected to SMU2.

Next steps

See the 4200A-SCS Learning Center, which is preinstalled on your system. Within the Learning Center you will find instructional videos, PDFs and HTML content. To access the Learning Center, click Help in the Clarius menu, press F1 while using Clarius, or select the desktop icon.

The 4200A-SCS Learning Center includes the following:

- **Instructional videos**: Contains basic and detailed information about using the system that will help you with the instrument.
- **Clarius Manual:** Provides comprehensive information about projects, tests, data analyzation, formulator data calculation, user library descriptions, customizing Clarius.
- **Hardware manuals** for setup and maintenance, source-measure units (SMUs), capacitance-voltage units (CVUs), pulse-measure units (PMUs), pulse-generator units (PGUs), and prober and external instrument control.
- **Programming guides** for the library LPT, Keithley User Library Tool (KULT) and Keithley External Control Interface (KXCI).
- **Application notes**: Detailed applications that demonstrate specific applications.
- **Data sheets**: Technical data regarding the 4200A-SCS and related accessories.

See tek.com/keithley for support and additional information about the instrument.

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

Find more valuable resources at TEK.COM.
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4200A-PKB-903-01 Rev. A October 2020