KEITHLEY 4200A-SCS Parameter Analyzer Tektronix Installation Guide

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Contents

Software Release Notes and Installation Instructions

Important information

The Clarius+ software application suite is the software for the Model 4200A-SCS Parametric Analyzer. Clarius+ software requires Microsoft® Windows® 10 to be installed on your Model 4200A-SCS Parametric Analyzer.

Introduction

This document provides supplemental information about the behavior of Clarius+ software. This information is organized into the categories presented in the following table.

Revision history	Lists the version of software, the document version, and the date of the software release.
New features and updates	Summary of each significant new feature and update included in Clarius+ software and the 4200A-SCS.
Problem fixes	Summary of each significant software or firmware bug fix in Clarius+ software and the 4200A-SCS.
Known issues	Summary of known issues and workarounds where possible.
Usage notes	Helpful information describing how to optimize the performance of Clarius+software and the 4200A-SCS.
Installation instructions	Detailed instructions describing how to install all software components, firmware, and help files.
Version table	Lists the hardware and firmware versions for this release.

Revision history

This document is periodically updated and distributed with releases and service packs to provide the most up-to-date information. This revision history is included below.

Date	Software version	Document number	Version
5/2024	v1.13	077132618	18
3/2023	v1.12	077132617	17
6/2022	V1.11	077132616	16
3/2022	V1.10.1	077132615	15
10/2021	V1.10	077132614	14
3/2021	V1.9.1	077132613	13
12/2020	V1.9	077132612	12
6/10/2020	V1.8.1	077132611	11
4/23/2020	V1.8	077132610	10
10/14/2019	V1.7	077132609	09
5/3/2019	V1.6.1	077132608	08
2/28/2019	V1.6	077132607	07
6/8/2018	V1.5	077132606	06
2/23/2018	V1.4.1	077132605	05
11/30/2017	V1.4	077132604	04
5/8/2017	V1.3	077132603	03
3/24/2017	V1.2	077132602	02
10/31/2016	V1.1	077132601	01
9/1/2016	V1.0	077132600	00

New features and updates

Major new features in this release include a new UTM UI Editor, updates to allow remote control of PMU using KXCI (including measurement support), and improvements to the Segment ARB configuration dialog for UTMs based on the PMU_examples_ulib user library.

When Clarius+ v1.13 is installed, you also need to upgrade the 4200A-CVIV firmware (refer to **Version table**). Refer to **STEP 5. Upgrade 42×0-SMU, 422x-PxU, 4225-RPM, 4225-RPM-LR, 4210-CVU, and 4200A-CVIV firmware** for information.

UTM UI Editor (CLS-431)

The new stand-alone UTM UI Editor replaces the UI Editor that was previously available in Clarius. This tool allows you to enhance the user interface that is automatically created when a UTM is developed. Through the UTM UI Editor, you can:

- Add or change the image that illustrates the test
- Change the grouping of UTM parameters
- Set up stepping or sweeping

- Add verification rules for input and output parameters
- Add visibility rules for parameters
- Add tooltips for parameters
- Determine if selected parameters are displayed in the center pane or the right pane

For detailed information on UTM UI Editor, refer to the “Define the UTM user interface” section of the Learning Center and the *Model 4200A-SCS Clarius User’s Manual*.

Updates to KXCI for PMU (CLS-692)

Added new commands to control PMU operations, including measurements, using the KXCI software.

For detailed information on the new commands, refer to the “KXCI PGU and PMU commands” section of the Learning Center and the *Model 4200A-SCS KXCI Remote Control Programming*.

Improved the tools for updating Segment Arb configuration (CLS-430)

The SARB Configuration dialog for updating Clarius UTMs based on the PMU_examples_ulib user library has been improved.

For detailed information on the SegARB dialog, refer to the “SegARB Config” section of the Learning Center and the *Model 4200A-SCS Clarius User’s Manual*.

Document changes

The following documents were updated to reflect the changes for this release:

- *Model 4200A-SCS Clarius User’s Manual* (4200A-914-01E)
- *Model 4200A-SCS Pulse Card (PGU and PMU) User’s Manual* (4200A-PMU-900-01C)
- *Model 4200A-SCS KULT Programming* (4200A-KULT-907-01D)
- *Model 4200A-SCS LPT Library Programming* (4200A-LPT-907-01D)
- *Model 4200A-SCS Setup and Maintenance User’s Manual* (4200A-908-01E)
- *Model 4200A-SCS KXCI Remote Control Programming* (4200A-KXCI-907-01D)

Other features and updates

Issue number	**CLS-389**
Subsystem	Clarius – Projects dialog
Enhancement	You can now open an existing project by double-clicking it with a mouse or double-tapping it on the touch screen.
Issue number	**CLS-457**
Subsystem	Learning Center
Enhancement	The Learning Center is no longer supported on Internet Explorer. It is supported on Google Chrome, Microsoft Edge Chromium (default), and Firefox.
Issue number	**CLS-499**
Subsystem	Clarius – User Libraries
Enhancement	Added a new 4-Channel PMU SegArb user module named PMU_SegArb_4ch to PMU_examples_ulib. This module configures multi-sequence, multi-segment waveform generation (Segment Arb) on four channels using two 4225-PMU cards. It measures and returns either waveform (V and I versus time) or spot mean data for each segment that has measurement enabled. It also provides a voltage bias by controlling up to four SMUs. The SMUs must not be connected to a 4225-RPM.
Issue number	**CLS-612** / **CAS-180714-S9P5J2**
Subsystem	Clarius – Save Data
Enhancement	The Save Data dialog now retains the previously selected directory.
Issue number	**CLS-615** / **CAS-180714-S9P5J2**
Subsystem	Clarius – Save Data
Enhancement	When saving data in the Analyze view, the dialog now provides feedback when the files have been saved.
Issue number	**CLS-618**
Subsystem	Clarius – Graph
Enhancement	Added a graph cursor configuration dialog to Clarius, which allows users to assign graph cursors to specific data series and runs in Run History.
Issue number	**CLS-667, CLS-710**
Subsystem	Clarius – Library
Enhancement	Added the vdsid user module in the parlib user library. This user module can configure a vdsid stepper in the UTM GUI and perform multiple SMU I-V sweeps at different gates voltages using the UTM stepper.

Issue number	**CLS-701**
Subsystem	Clarius – Desktop Mode
Enhancement	When Clarius is running in Desktop Mode, the messages pane no longer displays messages regarding the Clarius Hardware Server.
Issue number	**CLS-707**
Subsystem	Clarius – Library
Enhancement	All user modules in the parlib user library were updated to have a custom user interface.
Issue number	**CLS-708**
Subsystem	Clarius – Library
Enhancement	Added the user module PMU_IV_sweep_step_Example to the PMU_examples_ulib user library. This user module performs multiple PMU I-V sweeps at different gate voltages using the UTM stepper. This module is a functional programming reference to illustrate the basic LPT commands necessary to create a Vd-Id family of curves.
Issue number	**CLS-709**
Subsystem	Clarius – Library
Enhancement	The AFG_examples_ulib user library was updated to use the new UI Editor features, such as the new visibility rules.
Issue number	**CLS-746**
Subsystem	LPT
Enhancement	Changes were made to the LPT library for the PMU. This includes a setting to keep execution parameters in standby and to not reset the hardware until the setting is cleared. This setting must be cleared by calling the setmode command for the designated channel, KI_PXU_CH1_EXECUTE_STANDBY or KI_PXU_CH2_EXECUTE_STANDBY, at the last test execution.
Issue number	**CLS-865**
Subsystem	Clarius – PMU user modules
Enhancement	Several modules in PMU_examples_ulib were updated to use more consistent error codes, correct memory leaks, and comply with recommendations in *Model 4200A-SCS LPT Library Programming* (4200A-LPT-907-01D).
Issue number	**CLS-947**
Subsystem	KCon
Enhancement	Improved KCon CVU self-test prompt message.

Issue number	**CLS-975**
Subsystem	KXCI
Enhancement	Added the RV command, which instructs a SMU to go to a specific range immediately witho ut waiting until the initiation of a test.
Issue number	**CLS-979**
Subsystem	KXCI
Enhancement	Added the :ERROR:LAST:GET command to retrieve error messages fully remotely.

Problem fixes

Issue number	**CLS-361**
Subsystem	Clarius – UTM UI
Symptom	The UTM Module Settings tab for the Input Array type of parameters does not show specifie d units.
Resolution	This issue has been corrected.
Issue number	**CLS-408** / **CAS-151535-T5N5C9**
Subsystem	KCon
Symptom	KCon cannot detect Keysight E4980 or 4284 LCR meter.
Resolution	This issue has been corrected.
Issue number	**CLS-417** / **CAS-153041-H2Y6G0**
Subsystem	KXCI
Symptom	KXCI returns an error when running the Matrixulib ConnectPins function for the 708B switch matrix.
Resolution	This issue has been corrected when KXCI is set to ethernet.
Issue number	**CLS-418** / **CAS-153041-H2Y6G0**
Subsystem	KXCI
Symptom	The KXCI remote user library command added a space to string parameters when the para meter value was changed.
Resolution	This issue has been corrected.

Issue number	**CLS-474**
Subsystem	KXCI
Symptom	KXCI hangs and the 4200A remains in Operate Mode when a set of commands that include s the*RST command is sent.
Resolution	This issue has been corrected.
Issue number	**CLS-475**
Subsystem	Clarius – Analyze
Symptom	When converting legacy data files (.xls) to the new data storage format, the run settings may have text incorrectly shifted to the left.
Resolution	This issue has been corrected.
Issue number	**CLS-477**
Subsystem	Clarius – Run History
Symptom	Deleting all run history for a project could display an error message if a directory did not exist .
Resolution	This issue has been corrected and the error message was improved.
Issue number	**CLS-489**
Subsystem	Clarius
Symptom	Run settings are missing when exporting a test that includes multiple runs to the library.
Resolution	This issue has been corrected.
Issue number	**CLS-573** / **CAS-177478-N0G9Y9**
Subsystem	KCon
Symptom	KCon crashes if it needs to display an error during Update.
Resolution	This issue has been corrected.
Issue number	**CLS-577**
Subsystem	Clarius – Library
Symptom	The lake-shore-temp-controller project in the factory library is missing subsite data.
Resolution	This issue has been corrected.
Issue number	**CLS-734**
Subsystem	Clarius – Library
Symptom	The data grid for the parlib user library module vceic does not show a full array of data or sh ows too much data.
Resolution	This issue has been corrected.

Issue number	**CLS-801** / **CAS-215467-L2K3X6**
Subsystem	KULT
Symptom	In some scenarios, KULT crashes on startup with the message “OLE failed to initialize.”
Resolution	This issue has been corrected.
Issue number	**CLS-854** / **CAS-225323-B9G0F2**
Subsystem	Clarius – ITM
Symptom	The ITM error messages for PMU multiple pulse waveform capture tests do not make sense.
Resolution	This issue has been corrected. The value from the ICSAT formula is now used as the current value. This change affects the vcsat test in the default, bjt, and ivswitch projects.
Issue number	**CLS-857**
Subsystem	Clarius – ITM
Symptom	For ITMs in Clarius that use PMUs, ITMs that have a delay for the PMU pulse that is below 2 0 ns but not equal to 0 cause the test to run indefinitely.
Resolution	This issue has been corrected.
Issue number	**CLS-919**
Subsystem	Clarius – Saving Data
Symptom	Unable to save data to an .xlsx file from a test with a data sheet that contains more than 100 runs.
Resolution	This issue has been corrected.
Issue number	**CLS-961**
Subsystem	Clarius – Library
Symptom	Factory NAND projects (flash-disturb-nand, flashendurance-nand, flash-nand, andpmu-flash -nand) do not have return values in the data grid.
Resolution	This issue has been corrected.
Issue number	**CLS-987**
Subsystem	KXCI
Symptom	The KXCI TI command does not work if the TV command was executed previously.
Resolution	This issue has been corrected.

Issue number	**CLS-1001**
Subsystem	Clarius – Library
Symptom	The Lake Shore LS336 user library returns error messages when it tries to create text files i n the C:\ location.
Resolution	This issue has been corrected.
Issue number	**CLS-1024**
Subsystem	Clarius – Run History
Symptom	The user can select “Uncheck All” while a test is running, which corrupts data.
Resolution	This issue has been corrected.
Issue number	**CLS-1060** / **CAS-277738-V4D5C0**
Subsystem	Clarius – Library
Symptom	The PMU_SegArb_Example user module returns confusing errors.
Resolution	This issue has been corrected.
Issue number	**CLS-1117**
Subsystem	KCon, KXCI
Symptom	The KCon Configuration for KXCI ethernet does not allow the string terminator to be set to N one.
Resolution	This issue has been corrected.
Issue number	**CLS-1294**
Subsystem	Clarius – Library
Symptom	The mosfet-isd library test generates error message –12004.
Resolution	This issue has been corrected.

Known issues

Issue number	**SCS-6486**
Subsystem	Clarius
Symptom	It is difficult to move the line fit markers using the touchscreen.
Workaround	Use a mouse to move line fit markers.
Issue number	**SCS-6908**
Subsystem	4215-CVU
Symptom	Performing a frequency sweep with the start frequency higher than the stop frequency (swe ep down) may calculate incorrect frequency points.
Workaround	None.
Issue number	**SCS-6936**
Subsystem	Clarius
Symptom	Monitoring of PMU multi-channel tests does not work.
Workaround	None.
Issue number	**SCS-7468**
Subsystem	Clarius
Symptom	Some projects created in Clarius 1.12 cannot be opened using Clarius 1.11 and prior releases. Attempting to open the project in Clarius 1.11 results in “Corrupted test run history ” messages.
Workaround	Use Clarius 1.12 to export the project to a .kzp file with the “Export run data for Clarius versi on 1.11 or earlier” enabled. Import the project in Clarius 1.11.

Usage notes

Visual Studio Code Workspace Trust

As of May 2021, Visual Studio Code opens new file directories in Restricted Mode. Some Visual Studio Code features such as code execution and extensions are automatically disabled. Some features of the Clarius software (such as the KULT code extension) will not work unless you enable Workspace Trust for the applicable folders.

Follow this link for more information on trusting workspaces, enabling code extensions, and other topics related to Restricted **Mode:** **https://code.visualstudio.com/docs/editor/workspace-trust**

4200A-CVIV

Before using the Model 4200A-CVIV Multi-Switch, be sure to connect the SMUs using the 4200-PAs and

4200A-CVIV-SPT SMU Pass-Thru modules, and the CVU instrument cables to the 4200A-CVIV inputs. Make sure to close the Clarius application before opening KCon on the desktop. Then run the **Update Preamp, RPM, and CVIV Configuration** option in KCon. Include the action cviv-configure before a SMU or CVU test in the project tree to switch between I-V and C-V measurements.

4225-RPM

Before using the 4225-RPM Remote Amplifier Switch Module to switch between I-V, C-V, and Pulse ITMs, be sure to connect all instrument cables to the RPM inputs. Make sure to close the Clarius application before opening KCon on the desktop. Then run the **Update Preamp, RPM, and CVIV Configuration** option in KCon.

When using the 4225-RPM in UTMs, include the call in your user module to the LPT command rpm_config(). The RPM_switch user module in the pmuulib user library is deprecated. For more information, see the Help pane in Clarius.

4210-CVU or 4215-CVU

When choosing the Custom Cable Length in the CVU Connection Compensation dialog box of the Tools menu to perform open, short, and load simultaneously, you must run **Measure Custom Cable Length** first. Then enable **Open, Short, and Load CVU Compensation** within a test.

If you are performing Open, Short, and Load CVU Compensation when the CVU is connected to the 4200A-CVIV, a best practice is to use the cvu-cviv-comp-collect action.

4200-SMU, 4201-SMU, 4210-SMU, or 4211-SMU

Under certain conditions, when running SMU current sweeps at very fast ramp rates, the SMU may report compliance unexpectedly. This may occur if the sweep ramps are too high or too fast.

The workarounds for this situation are:

- Use the setmode command when generating user modules to turn off the compliance indicator With this workaround, the reading is returned as 105% of the present range.
- Use smaller sweep and ramp rates (dv/dt or di/dt).
- Use fixed SMU

LPTLIB

If a voltage limit of greater than 20 V is needed from a SMU set to force zero current, a measv call should be used to set the SMU to autorange to a higher range or set a higher voltage range with rangev.

If a current limit of greater than 10 mA is needed from a SMU set to force zero volts, a measi call should be used to set the SMU to autorange to a higher range or set a higher current range with rangei.

KULT

If you change or need to rebuild ki82ulib, please note that ki82ulib depends on ki590ulib and Winulib. You must specify these dependencies in the Options > Library Dependencies menu in KULT before building ki82ulib. The Options > Build Library function will fail if the dependencies are not properly selected.

KXCI

In KXCI System Mode, in both KI4200A emulation and HP4145 emulation, the following default current measurement ranges exist:

- **Limited Auto – 1 nA:** The default current measurement range for 4200 SMUs with
- **Limited Auto – 100 nA:** The default current measurement range for 4200 SMUs without

If a different bottom range is needed, use the RG command to set the specified channel to a lower bottom range. Example: RG 1,1e-11

This sets SMU1 (with preamplifier) to the Limited Auto – 10 pA range

Microsoft® Windows® mapped network drive error

When installing Clarius+ on a personal computer, Microsoft policy settings can limit Clarius+ from accessing mapped network drives in its file windows.

Modifying the registry will fix this issue.

To modify the registry:

1. Run **regedit**.
2. Navigate to
   HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\System.
3. If one does not exist, create a new DWORD entry named EnableLinkedConnections.
4. Set the value to
5. Restart the

Computer installation, language packs

Clarius+ does not support additional languages in Microsoft Windows 10 other than the English (United States) base language. If you encounter errors with Clarius+ while a language pack is installed, follow Microsoft instructions for removing the language pack.

Installation instructions

These directions are provided as a reference if you need to reinstall Clarius+ software on your 4200A-SCS. All CVU Open, Short, and Load compensation constants must be re-acquired after the latest version is installed.

If you are installing Clarius+ and ACS on the same system, Clarius+ must be installed first.

If you are using the KULT Extension, you must uninstall and reinstall the KULT Extension after installing Clarius+.

STEP 1. Archive your user-modified user library data (optional)

Installing Clarius+ software reinstalls the C:\S4200\kiuser\usrlib. If you made changes to the user library and do not want to lose these changes when this software is installed, copy these files to an alternate location before installation.

The easiest way to archive the user library is to copy the entire C:\S4200\kiuser\usrlib folder to a network drive or an archive area on the 4200A-SCS hard drive. Copy the files back after installation to restore them.

STEP 2. Uninstall the 4200A-SCS Clarius+ Software Tools

Before installing Clarius+, you need to uninstall the existing version using Windows Control Panel.

If you are uninstalling a version of Clarius+ later than V1.12 and plan to install an earlier version, you need to convert the projects from the HDF5 data file format to the Microsoft Excel 97 .xls data format.

NOTE : If you want to export run data for use in an earlier version of Clarius+ without uninstalling, you can use the Projects > Export option. Refer to the topic “Export a project” in the Learning Center for detail.

To uninstall Clarius⁺:

1. From Start, select **Windows System > Control Panel**.
2. Select **Uninstall a program**.
3. Select **Clarius+**.
4. For the prompt “Do you want to completely remove the selected application and all of its features?”, select **Yes**.
5. On the Convert Data Files dialog, if you want to:
    - Install a version prior to 12: Select **Yes**.
    - Reinstall 12 or a later version: Select **No**.
    - After completing the uninstall procedure, install Clarius+ as described in the release notes for the version you are
6. After completing the uninstall procedure, install Clarius+ as described in the release notes for the version you are installing.

STEP 3. Install the 4200A-SCS Clarius⁺ Software Tools

You can download the Clarius+ software from the **tek.com** website.
To download and install the Clarius+ software from the website:

1. Go to **com.**
2. Select the **Support**
3. Select **Find Software, Manuals, FAQs by Model**.
4. In the Enter Model field, enter **4200A-SCS**.
5. Select **Go**.
6. Select **Software**.
7. Select the software
8. Select the software link that you want to Note that you will need to log in or register to continue.
9. Unzip the downloaded file to a folder on the C:\
10. Double-click the exe file to install the software on your 4200A-SCS.
11. Follow the on-screen installation instructions. If a previous version of Clarius+ software is installed on your 4200A-SCS, you will be asked if you want to remove When asked, select **OK** to continue; selecting **No** will abort the installation. If a previous version of Clarius+ software is uninstalled, you must restart the system and then install the new Clarius+ software version.
12. After the installation is complete, select **Yes, I want to restart my computer now** to restart the 4200A-SCS before attempting to initialize or use the software

STEP 4. Initialize each 4200A-SCS user account

Each user account on the 4200A-SCS must be properly initialized before attempting to run any of the Clarius+ software tools. Failure to initialize may cause unpredictable behavior.

From the Microsoft Windows login screen, type the user name and password of the account to be initialized. This must be done for each of the two default Keithley factory accounts, and for any additional accounts added by the system administrator. The two factory accounts are:

User name	Password
kiadmin	kiadmin1
kiuser	kiuser1

When Windows has completed startup, select **Start > Keithley Instruments > Initialize New User**. This initializes the current user.

Repeat steps one and two for both Keithley accounts and for any additional accounts added by the system administrator.The HTML5-based Learning Center is not supported in Internet Explorer. The installation will install Microsoft Edge Chromium, but you may need to change the default browser on user accounts that have the default set to Internet Explorer. You can use one of the following browsers: Microsoft Edge Chromium, Google Chrome, or Firefox.

STEP 5. Upgrade 42×0-SMU, 422x-PxU, 4225-RPM, 4225-RPM-LR, 4210-CVU, and

4200A-CVIV firmware

Clarius software checks for compatible instrument firmware during startup and does not run if all instruments are not upgraded to compatible firmware versions.

To find the current hardware and firmware versions of your 4200A-SCS cards, use the KCon utility and select each card.

The firmware upgrade program automatically indicates the hardware that needs to be upgraded to the approved or latest firmware version.

The 4200A-SCS cards are organized by families of related models, as shown in the following.

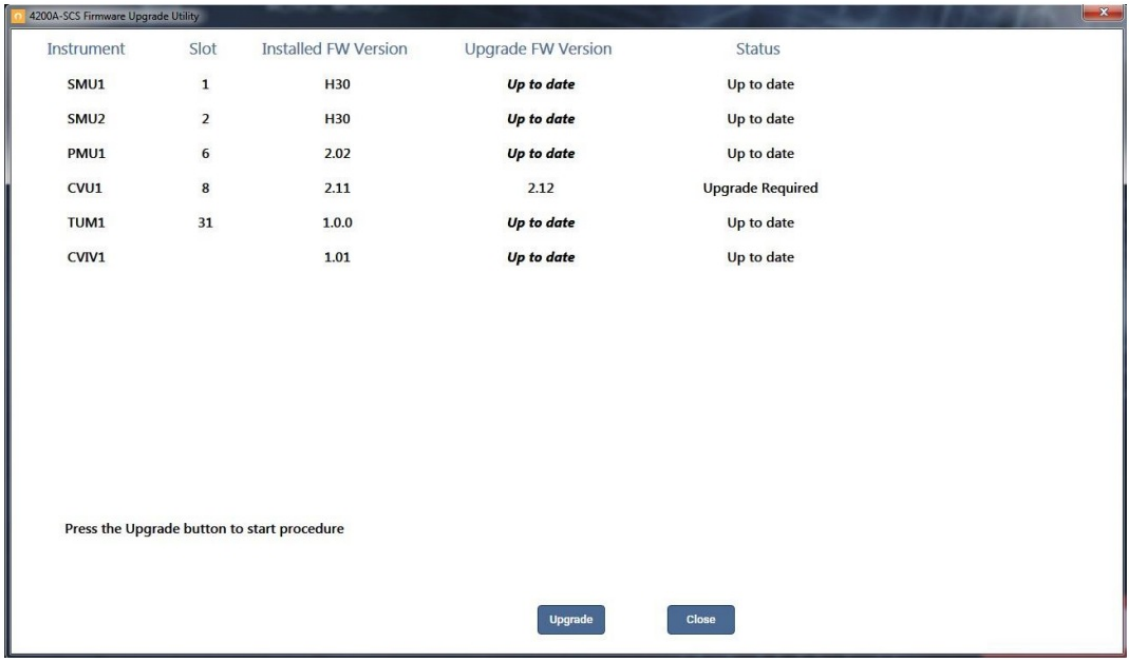
To upgrade the firmware of your 4200A-SCS cards:

It is strongly recommended that you connect the 4200A-SCS to an uninterruptible power supply during the firmware upgrade process. If power is lost during the firmware upgrade, the instruments may no longer be functional and will require factory servicing.

1. Exit all Clarius+ software programs and any other Microsoft Windows
2. From the Windows taskbar, select **Start**.
3. In the Keithley Instruments folder, select the **Firmware Upgrade**
4. If your instrument needs to be upgraded, the upgrade button becomes visible and there is an indication in Status that an upgrade is required for an instrument, as shown
5. Select **Upgrade**.

The Firmware Upgrade Utility dialog below shows that the upgrade is not complete. The CVU1 requires upgrading.

The Firmware Upgrade Utility dialog



Version table

4200A-SCS instrument family	Hardware version from KCon	Firmware version
4201-SMU, 4211-SMU, 4200-SMU, 4210-SMU1	05,XXXXXXXX or 5,XXXXXXXX	H31
	06,XXXXXXXX or 6,XXXXXXXX	M31
	07,XXXXXXXX or 7,XXXXXXXX	R34
4200-PA	This product cannot be flash upgraded in the field	—
4210-CVU	ALL (3.0, 3.1, 4.0, and later)	2.15
4215-CVU	1.0 and later	2.16
4220-PGU, 4225-PMU2	1.0 and later	2.08
4225-RPM, 4225-RPM-LR	1.0 and later	2.00
4200A-CVIV3	1.0	1.05
4200A-TUM	1.0	1.0.0
	1.3	1.1.30

1. There are several different models of SMUs available in the 4200A-SCS: 4201-SMU or 4211-SMU (medium power) and 4210-SMU or 4211-SMU (high power); all use the same firmware file.
2. The 4225-PMU and 4220-PGU share the same pulse and source board. The 4225-PMU adds measure capability through an additional hardware board but uses the same firmware file.
3. The 4200A-CVIV firmware contains two files to upgrade. The firmware utility uses both files in the version folder.

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Documents / Resources

	KEITHLEY 4200A-SCS Parameter Analyzer Tektronix [pdf] Installation Guide 4200A-SCS Parameter Analyzer Tektronix, 4200A-SCS, Parameter Analyzer Tektronix, Analyzer Tektronix, Tektronix

References

- Test and Measurement Equipment | Tektronix
- Keithley Instruments & Products | Tektronix
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