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## Software Release Notes and Installation Instructions

### Important information

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

### Introduction

This document provides supplemental information about the behavior of Clarius<sup>+</sup> software. This information is grouped into the following categories:

<a href="#">Revision history</a>	Lists the version of software, the document version, and the date of the software release.
<a href="#">New features and enhancements</a>	Summary of each significant new feature and enhancement included in Clarius <sup>+</sup> software and the 4200A-SCS.
<a href="#">Problem fixes</a>	Summary of each significant software or firmware bug fix in Clarius <sup>+</sup> software and the 4200A-SCS.
<a href="#">Usage notes</a>	Helpful information describing how to optimize the performance of Clarius <sup>+</sup> software and the 4200A-SCS.
<a href="#">Installation instructions</a>	Detailed instructions describing how to install all software components, firmware, and help files.
<a href="#">Version table</a>	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
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 enhancements

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<b>Issue number</b>	<b>SCS-974</b>
<b>Subsystem</b>	Learning Center
<b>Enhancement</b>	The Learning Center icon is now a home button.

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<b>Issue number</b>	<b>SCS-5640</b>
<b>Subsystem</b>	Manuals (LPT and KXCI commands)
<b>Enhancement</b>	LPT and KXCI command descriptions have been updated to show the correct units of measure.

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<b>Issue number</b>	<b>SCS-5685</b>
<b>Subsystem</b>	Learning Center
<b>Enhancement</b>	<p>The Learning Center was ported from WebHelp to a responsive HTML5 version of help. The new help format offers better search capabilities, saved searches, and favorites pages.</p> <p>The updated Learning Center also includes Learning Maps for pulse cards, switching, and installation to help guide users to the correct information.</p> <p>The default browser that is supplied with the 4200A-SCS is Microsoft® Edge™ Chromium, replacing Internet Explorer®. You can also use Firefox or Google Chrome.</p>
<b>Issue number</b>	<b>SCS-5737</b>
<b>Subsystem</b>	Calibration
<b>Enhancement</b>	Clarius+ V1.10 includes support for the MSO44 scope for calibration of the 4200A-SCS. In addition to the scope, a TEK-USB-488 GPIB to USB Adapter is required. This setup requires specific GPIB settings as outlined in the updated manufacturing and service procedures.
<b>Issue number</b>	<b>SCS-5768</b>
<b>Subsystem</b>	Clarius (Applications)
<b>Enhancement</b>	A new test for measuring the drain current 1/f noise measurement of a MOSFET was added to the Test Library.
<b>Issue number</b>	<b>SCS-5865</b>
<b>Subsystem</b>	Clarius
<b>Enhancement</b>	Progress bars have been added for lengthy operations. File operations to the Project Tree, Library Selector, and Project dialog have been updated to run asynchronously and provide progress feedback.
<b>Issue number</b>	<b>SCS-5910</b>
<b>Subsystem</b>	Clarius (User libraries)
<b>Enhancement</b>	The maximum sample count in the <code>cvuulib</code> has increased from 5000 to 10000.
<b>Issue number</b>	<b>SCS-6000</b>
<b>Subsystem</b>	Learning Center
<b>Enhancement</b>	A glossary has been added to the Learning Center.
<b>Issue number</b>	<b>SCS-6065</b>
<b>Subsystem</b>	Clarius (User libraries)
<b>Enhancement</b>	<p>A new user module has been created in <code>PMU_examples_ulib</code> that uses 8 channels of PMU and the option to use 4 SMU biasing channels to perform parallel testing of a device. The user module consists of 182 parameters.</p> <pre>int PMU_SegArb_8ch( double VRangeCh1, double IRangeCh1, double VRangeCh2, ...)</pre>

<b>Issue number</b>	<b>SCS-6197</b>
<b>Subsystem</b>	Learning Center
<b>Enhancement</b>	A new application note, <i>1/f Current Noise Measurements Using the 4200A-SCS Parameter Analyzer</i> , has been added to the Learning Center.
<b>Issue number</b>	<b>SCS-6210</b>
<b>Subsystem</b>	Clarius, KCon, KXCI, KPulse, KULT
<b>Enhancement</b>	The Learning Center buttons and menu options now open the Learning Center from Clarius+ applications in the default web browser rather than always opening in Internet Explorer.
<b>Issue number</b>	<b>SCS-6259</b>
<b>Subsystem</b>	System
<b>Enhancement</b>	On 4200A-SCS systems that do not have Microsoft Edge (Chromium) installed, the browser will be installed when upgrading to Clarius+ v1.10. On computers that do not have Microsoft Edge (Chromium) installed, a prompt is displayed to allow you to decide whether to install Microsoft Edge when upgrading to Clarius+ v1.10.
<b>Issue number</b>	<b>SCS-6265</b>
<b>Subsystem</b>	Learning Center
<b>Enhancement</b>	The Learning Center desktop and start menu shortcuts now open in the default web browser rather than always opening in Internet Explorer.

## Problem fixes

<b>Issue number</b>	<b>SCS-499</b>
<b>Subsystem</b>	Learning Center
<b>Symptom</b>	The Learning Center does not support whole-word search.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-789</b>
<b>Subsystem</b>	Learning Center
<b>Symptom</b>	Learning Center Content tree does not automatically expand to show nearby topics.
<b>Resolution</b>	This issue has been corrected.

<b>Issue number</b>	<b>SCS-4771</b>
<b>Subsystem</b>	KULT
<b>Symptom</b>	Ctrl+Z (Undo) and Ctrl+Y (Redo) do not function when editing a user test module (UTM).
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5253</b>
<b>Subsystem</b>	KULT
<b>Symptom</b>	Copying or renaming a module to the same name deletes the module.
<b>Resolution</b>	This issue has been corrected. You can now modify the module name with only a change in upper or lower case. This update affects module names only, not library names.
<b>Issue number</b>	<b>SCS-5549</b>
<b>Subsystem</b>	CVU, KCon
<b>Symptom</b>	The PLL Lock (101.1) test in KCon Self Test may fail for the 4215-CVU.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5621</b>
<b>Subsystem</b>	System
<b>Symptom</b>	A compatibility problem exists when installing ACS V5.4 onto a Clarius+ V1.9 system that prevents compiling of Clarius USRLIB modules.
<b>Workaround</b>	If you will be installing ACS and compiling Clarius USRLIB modules, please contact Keithley instruments for an ACS 5.4 Hot Fix.
<b>Resolution</b>	This issue has been corrected. Running Clarius+ V1.10 with ACS requires ACS V6.0 or later.
<b>Issue number</b>	<b>SCS-5635</b>
<b>Subsystem</b>	Clarius (User libraries)
<b>Symptom</b>	Attempting to run a test or save a project when the <code>read_double</code> or <code>query_double</code> action had the <code>numReadings</code> parameter set to 0 caused a confusing error message.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5638</b>
<b>Subsystem</b>	Manuals (KULT)
<b>Symptom</b>	The documentation to set breakpoints using the KULT Extension is incomplete.
<b>Resolution</b>	This issue has been corrected.

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<b>Issue number</b>	<b>SCS-5639</b>
<b>Subsystem</b>	KXCI
<b>Symptom</b>	Information on parameter formats and data return when calling a user library using KXCI was missing.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5661</b>
<b>Subsystem</b>	KXCI
<b>Symptom</b>	The <code>PN</code> command should reject negative values for the pulse delay time.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5662</b>
<b>Subsystem</b>	KXCI
<b>Symptom</b>	The <code>:CVU:FSTEPSIZE</code> command should reject invalid input.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5663</b>
<b>Subsystem</b>	KXCI
<b>Symptom</b>	The <code>PG</code> command should provide a warning when burst count is specified for continuous mode.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5669</b>
<b>Subsystem</b>	Clarius
<b>Symptom</b>	A test cannot be stopped when graphing data at a high speed. The issue occurs when running a very fast SMU sampling test and graphing collected data. The test takes 4,000 samples as quickly as possible (custom speed mode with smallest settings possible) on a fixed range.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5670</b>
<b>Subsystem</b>	Clarius
<b>Symptom</b>	When running a UTM test, if the UTM returns data after the test run time, aborting the test returns the data from the previous run. These UTMs update data in the Clarius grid and graph only after the UTM is completed in one batch. This issue does not affect UTMs that generate data in real time.
<b>Resolution</b>	This issue has been corrected.

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<b>Issue number</b>	<b>SCS-5690</b>
<b>Subsystem</b>	Clarius
<b>Symptom</b>	After deleting a project, the project buttons (Copy, Cut, Edit, and Delete) are still enabled and the selected path still shows the path for the deleted project.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5716</b>
<b>Subsystem</b>	Manuals (KXCI)
<b>Symptom</b>	KXCI manual missing reference to GPIB adapter commands.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-5728</b>
<b>Subsystem</b>	Calibration
<b>Symptom</b>	The 421x-CVU verification results for the Gp readings in the calibration report contained a calculation error.
<b>Resolution</b>	This issue has been corrected. As a part of this fix, the Gp specifications were changed to typical.
<b>Issue number</b>	<b>SCS-5803</b>
<b>Subsystem</b>	Clarius (Subsite)
<b>Symptom</b>	GNDU is not an option in the Clarius subsite stress configuration so that the GNDU cannot be switched to the device.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-6081/AR66207</b>
<b>Subsystem</b>	Clarius
<b>Symptom</b>	Imported 4200-SCS tests may have a grouped device and test in the project tree with no runs. This may happen when importing legacy projects with unsupported characters in test or device names.
<b>Resolution</b>	This issue has been corrected
<b>Issue number</b>	<b>SCS-6082</b>
<b>Subsystem</b>	Clarius (Analyze > Run History)
<b>Symptom</b>	Some users may experience imported 4200-SCS tests displaying a "history out of sync" error in the run history.
<b>Resolution</b>	This issue has been corrected.

<b>Issue number</b>	<b>SCS-6215</b>
<b>Subsystem</b>	Calibration
<b>Symptom</b>	The 422x-PxU pulse jitter verification should be a typical specification in the 4200A calibration report, as documented in the data sheet.
<b>Resolution</b>	This issue has been corrected.
<b>Issue number</b>	<b>SCS-6258/AR66455</b>
<b>Subsystem</b>	Clarius (Configuration)
<b>Symptom</b>	PMU configuration errors in an interactive test module (ITM) may occur when using insufficient timing parameters.
<b>Resolution</b>	This issue has been corrected. The previous error message has been clarified.
<b>Issue number</b>	<b>SCS-6335</b>
<b>Subsystem</b>	Calibration
<b>Symptom</b>	Updates are required for the 421x-CVU specification.
<b>Resolution</b>	This issue has been corrected. The following specifications were changed: 1 pF (4215-CVU): 1.2 $\mu$ s (old specification) to 1.7 $\mu$ s (new specification) 1 pF (4210-CVU): 590 ns to 600 ns 10 pF: 1.8 $\mu$ s to 3.9 $\mu$ s (both 4210-CVU and 4215-CVU) 1 nF: 99 $\mu$ s to 176 $\mu$ s (both 4210-CVU and 4215-CVU)
<b>Issue number</b>	<b>SCS-6353</b>
<b>Subsystem</b>	Clarius
<b>Symptom</b>	Some users cannot open a project after upgrading from Clarius+ V1.3 to V1.9.1 because some tests from the project have the "=" character in their names. The "=" character had not been permitted in Clarius test names beginning with Clarius+ V1.4.
<b>Resolution</b>	This issue has been corrected. Clarius will automatically replace the "=" character with the "_" character in test names.



## 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. Various features of the Clarius software (such as the KULT code extension) will not work unless you enable Workspace Trust for the applicable folders.

Please see the following 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 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 value. 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 ranges.

## 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 make changes to or need to rebuild `ki82uilib`, please note that `ki82uilib` depends on `ki590uilib` and `winuilib`. You must specify these dependencies in the Options > Library Dependencies menu in KULT before building `ki82uilib`. 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 preamplifiers.
- **Limited Auto – 100 nA:** The default current measurement range for 4200 SMUs without preamplifiers.

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

## Subsite Stress Mode

In Stress/Measure Mode, selecting the Leave Stress Conditions On checkbox maintains the stress voltage or current during the subsequent device testing. However, if the system configuration includes a matrix, then all outputs are turned off, regardless of the checkbox setting to prevent damaging matrix relays. Also, with a 4200A-CVIV Switch in the configuration, all outputs are turned off if any signals are routed through the 4200A-CVIV Switch, regardless of the checkbox setting. The stress signals can be left on if they are all directly connected outside of the CVIV Switch, but they are reset when a CVIV connection is made in the subsequent device testing to prevent damaging relays.

## 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 1.
5. Restart the computer.

## 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 new version is installed.

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

Installing Clarius+ software reinstalls the `C:\4200\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. Install the 4200A-SCS Clarius+ Software Tools

You can download the Clarius+ software from the [tek.com](http://tek.com) website.

#### *To download and installing the Clarius+ software from the website:*

1. Go to [www.tek.com](http://www.tek.com).
2. Select the **Support** link.
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 version.
8. Select the software link that you want to download. Note that you will need to log in or register to continue.
9. Unzip the downloaded file.
10. Double-click the `setup.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 it. 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 tools.

### STEP 3. 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.

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## NOTE

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.

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## STEP 4. Upgrade 42x0-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 below.

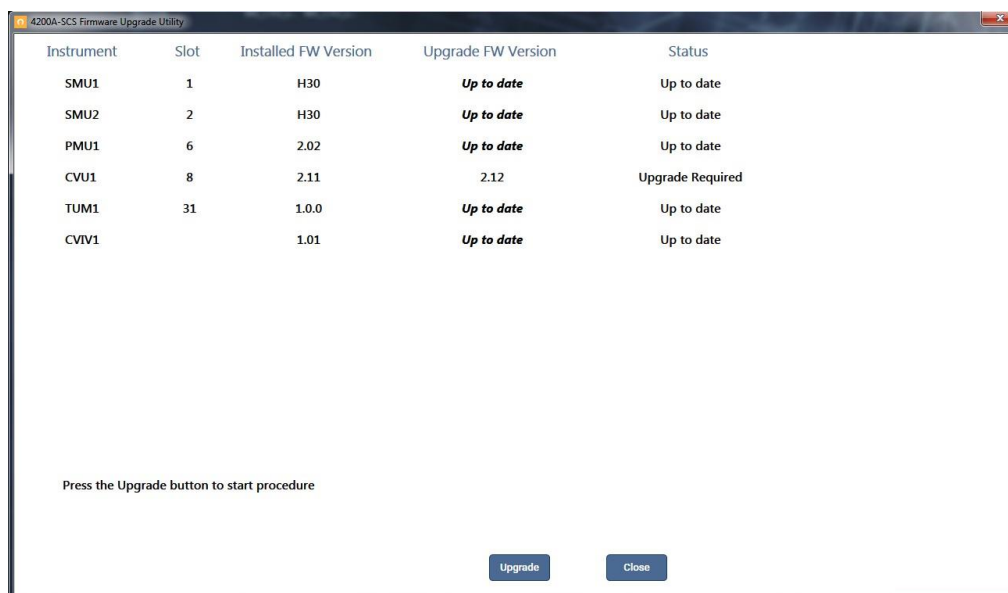
### To upgrade the firmware of your 4200A-SCS cards:

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 programs.
2. From the Windows taskbar, select **Start**.
3. In the Keithley Instruments folder, select the **Firmware Upgrade** tool.
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 below.
5. Select **Upgrade**.

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

The Firmware Upgrade Utility window



## Version table

4200A-SCS instrument family	Hardware version from KCon	Firmware version
4201-SMU, 4211-SMU, 4200-SMU, 4210-SMU <sup>1</sup>	05,XXXXXXXX or 5,XXXXXXXX	H31
	06,XXXXXXXX or 6,XXXXXXXX	M31
	07,XXXXXXXX or 7,XXXXXXXX	R33
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-PMU <sup>2</sup>	1.0 and later	2.08
4225-RPM, 4225-RPM-LR	1.0 and later	2.00
4200A-CVIV <sup>3</sup>	1.0	1.04
4200A-TUM	1.0	1.00
	1.3	1.1.30

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> The 4200A-CVIV firmware contains two files to upgrade. The firmware utility uses both files in the version folder.