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Capacitance Voltage Unit (CVU) Quick Start Guide

Model 4200-CVU Quick Start Guide overview

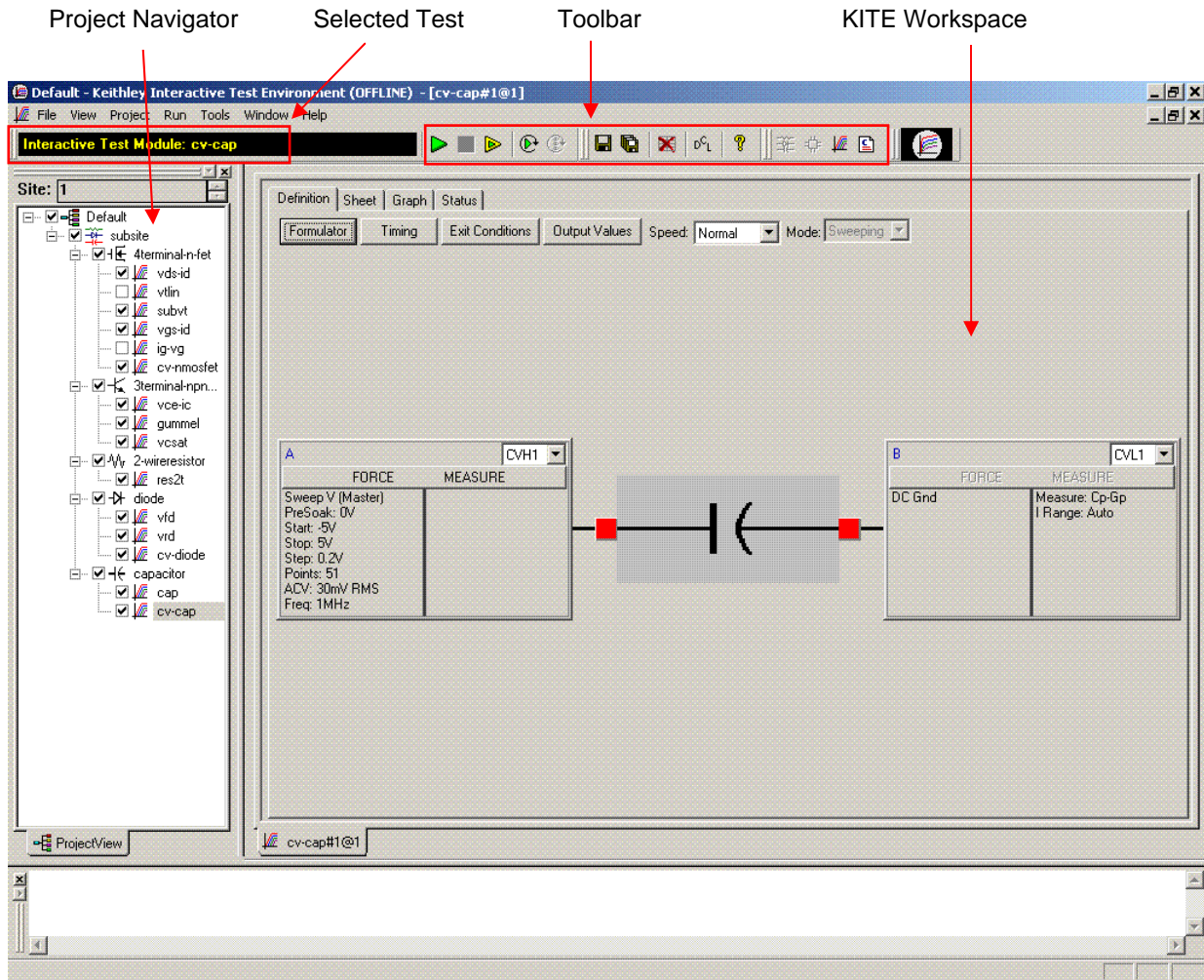
You can quickly begin using your Keithley Instruments Model 4200 Capacitance Voltage Unit (Model 4200-CVU) by performing the steps in this Quick Start Guide (QSG). For detailed information about the Model 4200-CVU, refer to the Complete Reference CD-ROM that came with your Model 4200-SCS Semiconductor Characterization System.

The steps outlined below and detailed in the following pages will allow you to quickly begin using your Model 4200-CVU:

- Step 1: Unpack your Model 4200-SCS.
- Step 2: Make basic system connections (power cord, keyboard, and optional printer)
- Step 3: Connect a test fixture to the Model 4200-SCS (Model 4200-CVU card preinstalled)
- Step 4: Power-up and log on
- Step 5: Start the KITE software and select the “cv-cap” test in the default project
- Step 6: Define your test
- Step 7: Run the “cv-cap” test
- Step 8: View the data sheet
- Step 9: View the graph
- Step 10: Print and export data

The example in this QSG uses the default project and runs the “cv-cap” test. If you wish to select a different project and/or test, you must modify the procedures accordingly. Figure 1 shows how the Keithley Interactive Test Environment (KITE) window will look after the default project and “cv cap” test are selected.

Figure 1: KITE interface with the "cv-cap" test selected in the default project



Quick-start instructions

Step 1: Unpack your Model 4200-SCS

The box contains:

- Model 4200-SCS Semiconductor Characterization System, with the Model 4200-CVU card integrated into the mainframe.

NOTE: How to lift the Model 4200-SCS:

- Lift from the bottom, not from the front bezel.
 - Set it on a bench or install it in a rack using the optional slide rack mounting kit.
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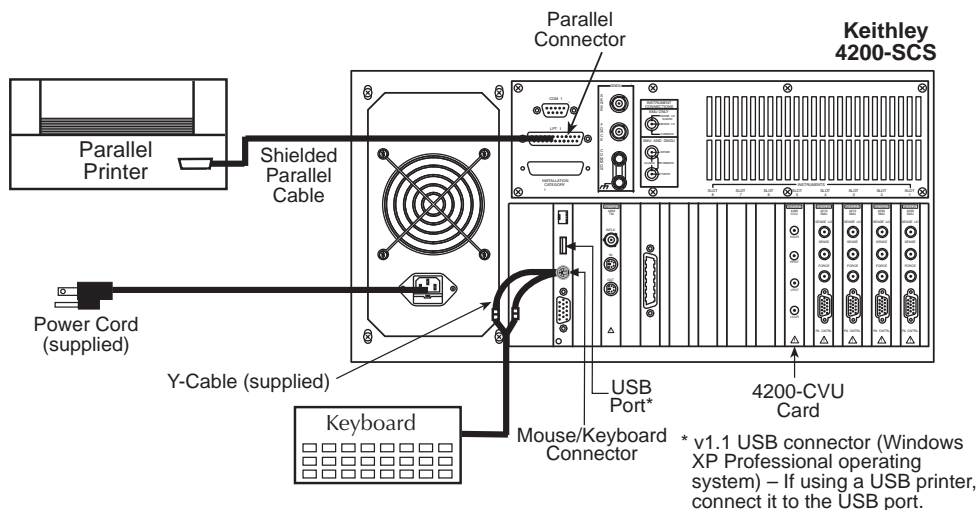
- Keyboard with built-in pointing device
- Two triax cables for each source-measure unit (SMU)
- Four red SMA to SMA cables for the Model 4200-CVU
- Connectors: Four SMA to BNC adapters; 2 BNC tees
- Y-Cable: Use to connect the keyboard to the mainframe
- Power cord
- Model 4200-SCS KTE Interactive CD-ROM
- Model 4200-SCS Complete Reference CD-ROM

Step 2: Make basic system connections (power cord, keyboard, and optional printer)

Basic system connections to the Model 4200-SCS (shown in Figure 2) include the keyboard (which has a built-in pointing device), the supplied power cord, and an optional printer. If you are using a USB printer, connect it to the USB port.

WARNING *Plug the female end of the supplied power cord into the Model 4200-SCS, but DO NOT connect the male end to line power at this time. Steps 2 and 3 in the QSG must be performed with the line power disconnected.*

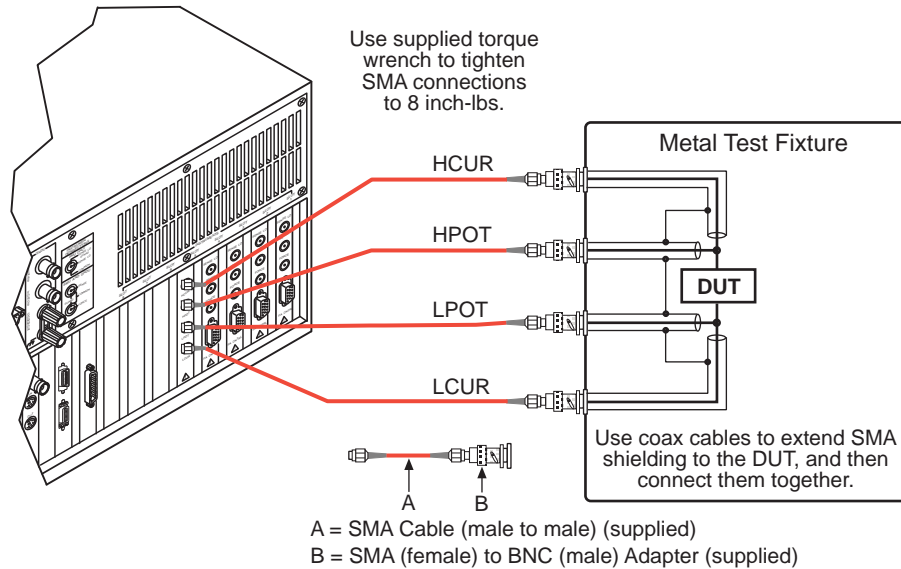
Figure 2: System connections



Step 3: Connect a test fixture to the Model 4200-SCS (Model 4200-CVU card preinstalled)

Figure 3 shows how to connect a BNC test fixture to the Model 4200-SCS. The red SMA cables and BNC adapters are supplied with the Model 4200-CVU card.

Figure 3: DUT test fixture connections to the Model 4200-CVU



Step 4: Power-up and log on

1. Make sure the POWER switch is in the OFF (out) position. The POWER switch is located on the front panel in the lower right corner.
2. Plug the male end of the line cord into a properly-grounded AC line power receptacle.
3. Turn on the Model 4200-SCS by pushing in the **POWER** switch to the ON (in) position.
4. At the KIUSER prompt, press **ENTER**. There is no password for this account.

CAUTION When first starting a KTE Interactive software tool, you must answer "Yes" to an on-screen license agreement. Answering "No" makes your system nonfunctional until you reinstall the software.

Step 5: Start the KITE software and select the “cv-cap” test in the default project

1. Start the KITE software by double-clicking the KITE icon on the Microsoft® Windows® desktop (see Figure 4):

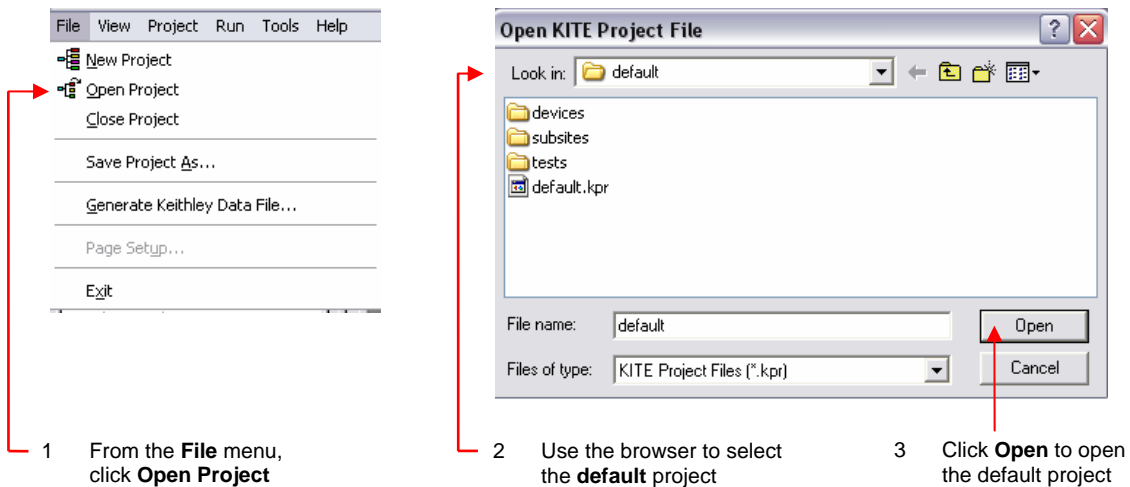
Figure 4: The KITE icon



2. When KITE starts, the default project will open automatically. If a different project opens, perform the three steps in Figure 5 to open the default project. The Project Navigator for the default project is shown in Figure 1.

NOTE If the Project Navigator is not displayed when KITE is started, click the View menu and select the Project Navigator item. The View menu is located on the upper left side of the menu bar in the KITE window.

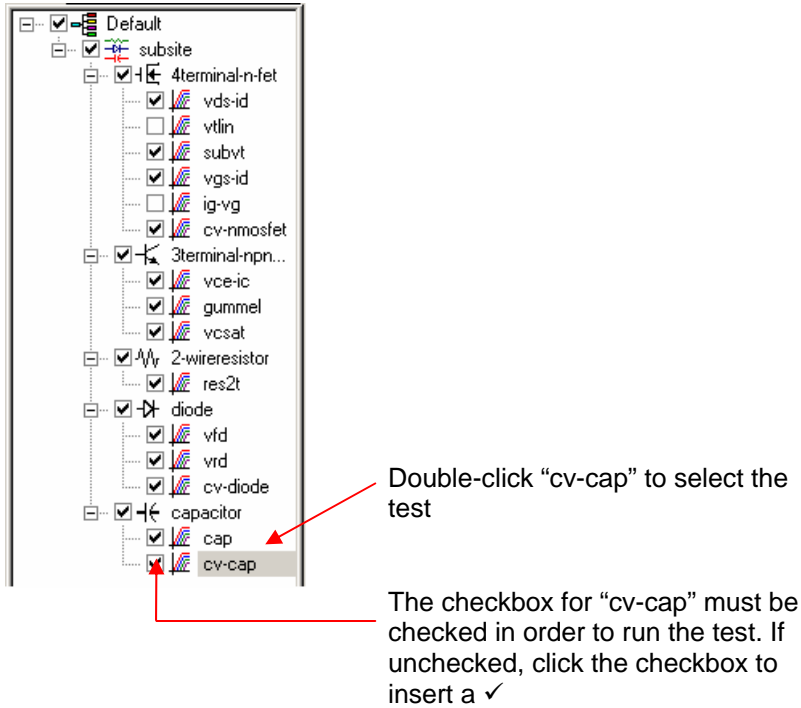
Figure 5: Open default project



NOTE When browsing, use the following directory path to locate the “default.kpr” project file:
C:\S4200\kiuser\Projects\default\default.kpr

3. Select the “cv-cap” test, as shown in Figure 6.

Figure 6: Default project in Project Navigator: Selecting the “cv-cap” test



Step 6: Define your test

The test is defined from the test Definition tab shown in Figure 7. As shown in the tab, the device in this example is connected to the CVH1 and the CVL1 terminals of the Model 4200-CVU. In this test, the DC bias is swept from -5V to 5V in 0.2V steps, with a 1MHz capacitance measurement taken at each step.

1. If desired, the setup for cv-cap can be changed. A settings window is displayed by clicking the appropriate **FORCE MEASURE** bar as shown in Figure 7. Figure 8 shows the Forcing Functions / Measure Options window for cv-cap setup.

Figure 7: cv-cap Definition tab: How to display a setup window for the CVU instrument

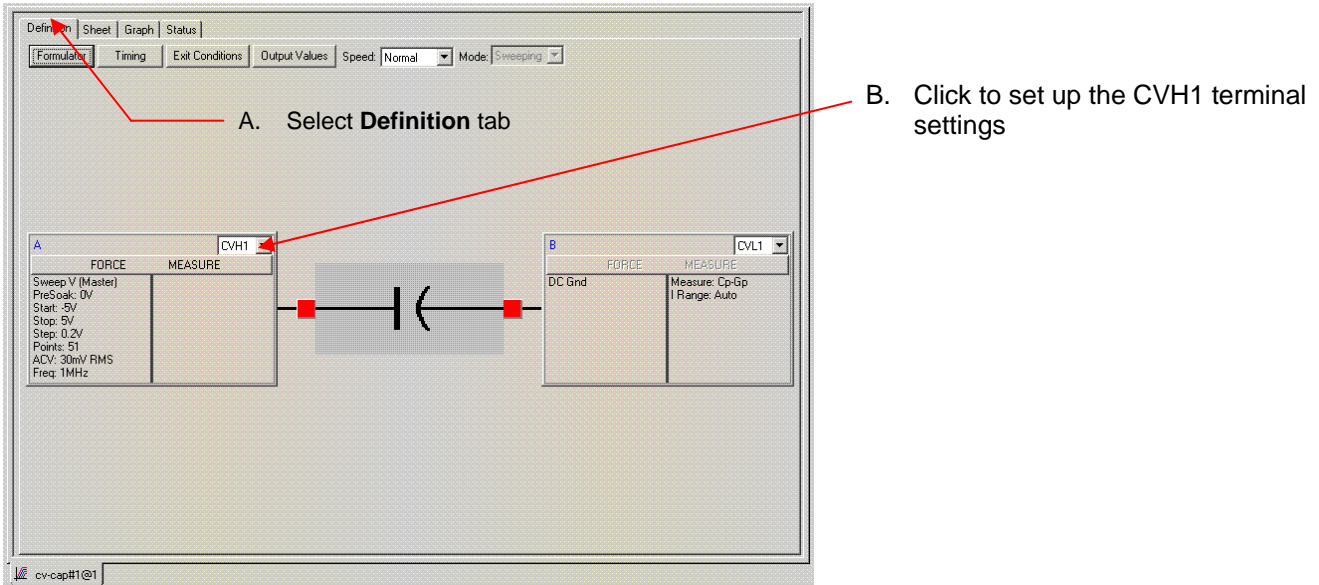
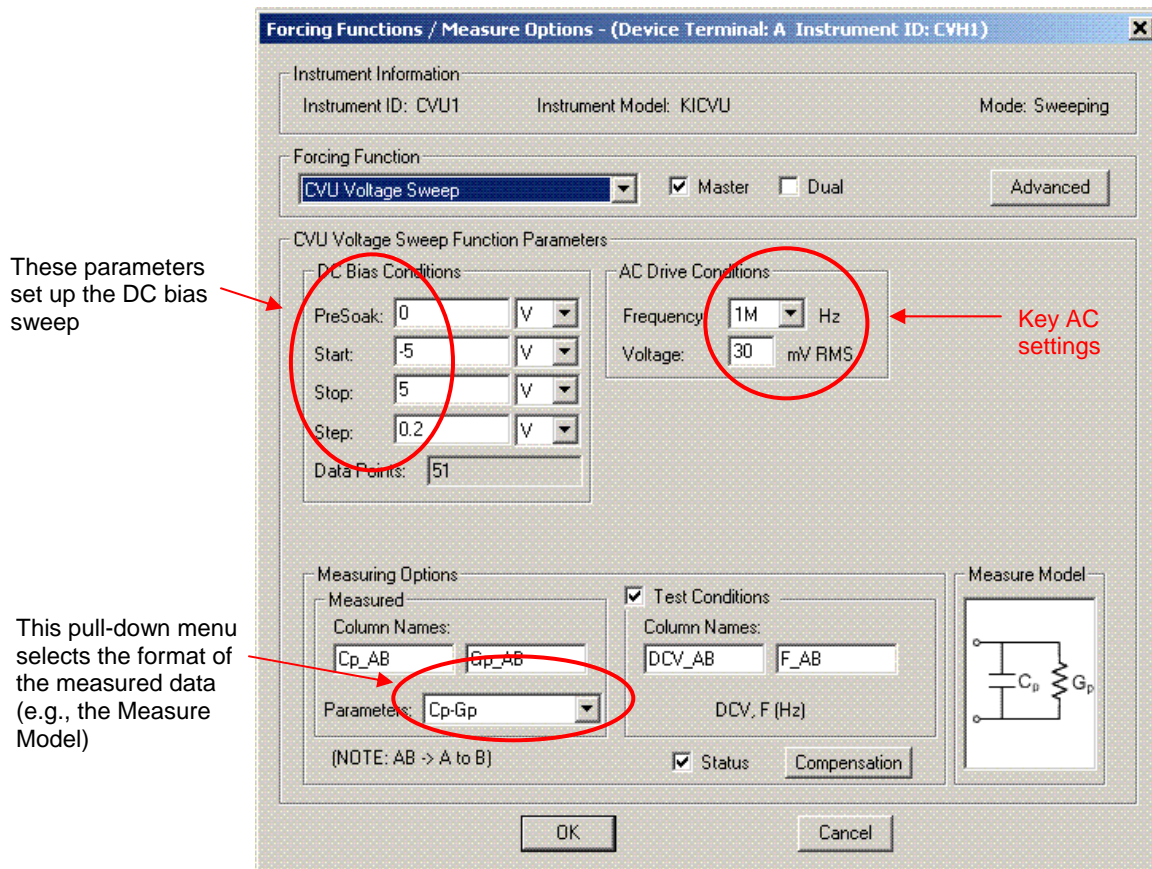
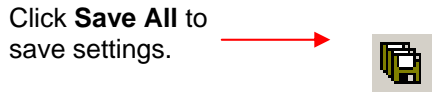


Figure 8: Setup for CVU pin CVH1



2. After making any changes to the test definition, click the **Save All** button on the toolbar to save the settings (see Figure 9).

Figure 9: The Save All button



Step 7: Run the “cv-cap” test

1. In the Project Navigator (see Figure 6), make sure the “cv-cap” test is highlighted and the checkbox is checked.
2. On the toolbar, click the green Run Test button to run the test one time (see Figure 10).

Figure 10: The Run Test button



While the test is running, the Run Test button turns gray and the Abort Test button turns red. Also, the MEASURING indicator (located on lower right corner of the front panel) will be on while the test is running. When the test is finished, the Run Test button turns green.

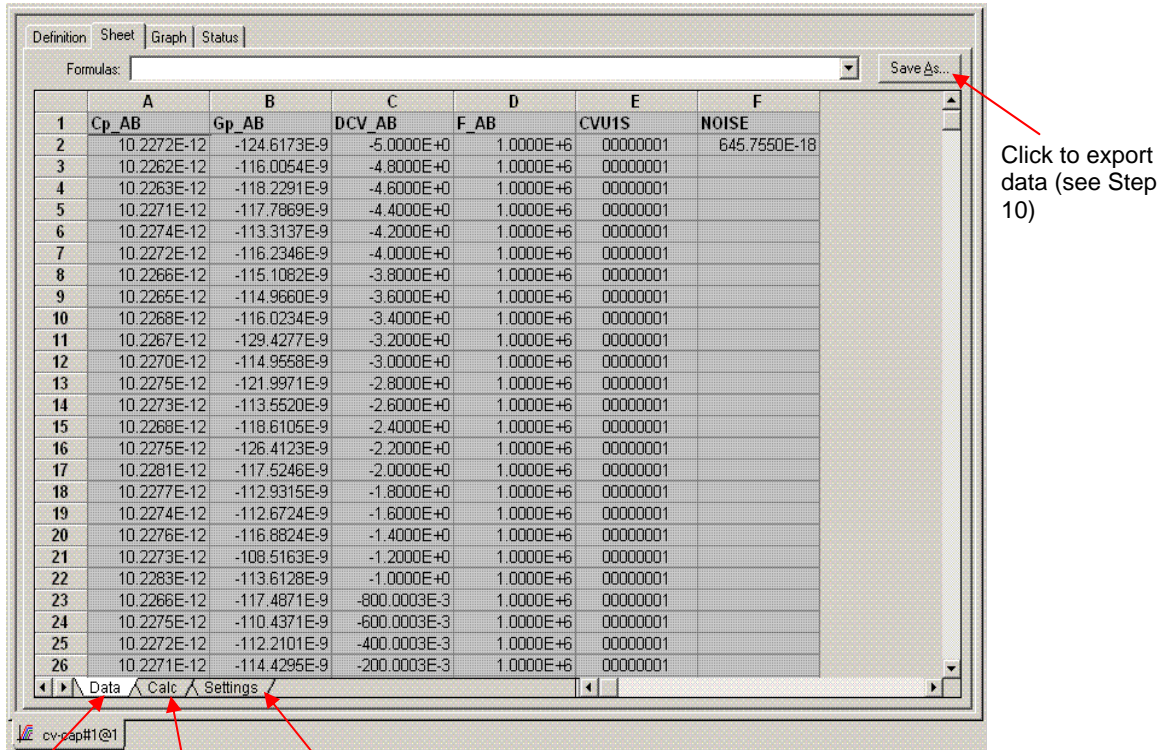
Troubleshooting hints:

- A selected test will not run if the Run Test button is not green. Here are a few reasons why the Run Test button will not be green:
 - A test is still running.
 - The checkbox for the test is not checked (see Figure 6).
 - Changes to the test setup were not saved (see Step 6B).
- If a selected test still will not run, click the Status tab for the test. This tab provides status information for the test.

Step 8: View the data sheet

The data sheet for the “cv-cap” test is displayed by clicking the Sheet tab for the test. Use the tabs at the bottom of the Sheet to display the data type. A sample data sheet for the “cv-cap” test is shown in Figure 11.

Figure 11: Sample data sheet for the “cv-cap” test



Click to display Data Sheet Click to display Calc Sheet Click to display Settings Sheet

Click to export data (see Step 10)

NOTE To select more than one sheet for selective printing, hold down the **Ctrl** key and then click the tab. See Step 10 to print Sheet data.

Step 9: View the graph

The graph for the “cv-cap” test is displayed by clicking the Graph tab for the test. A sample graph for the “cv-cap” test is shown in Figure 12. Notice that the extracted NOISE parameter is included on the screen.

The Graph Settings menu (shown in Figure 13) was used to select the Legend box and change series colors.

Figure 12: Sample graph for “vds-id” test

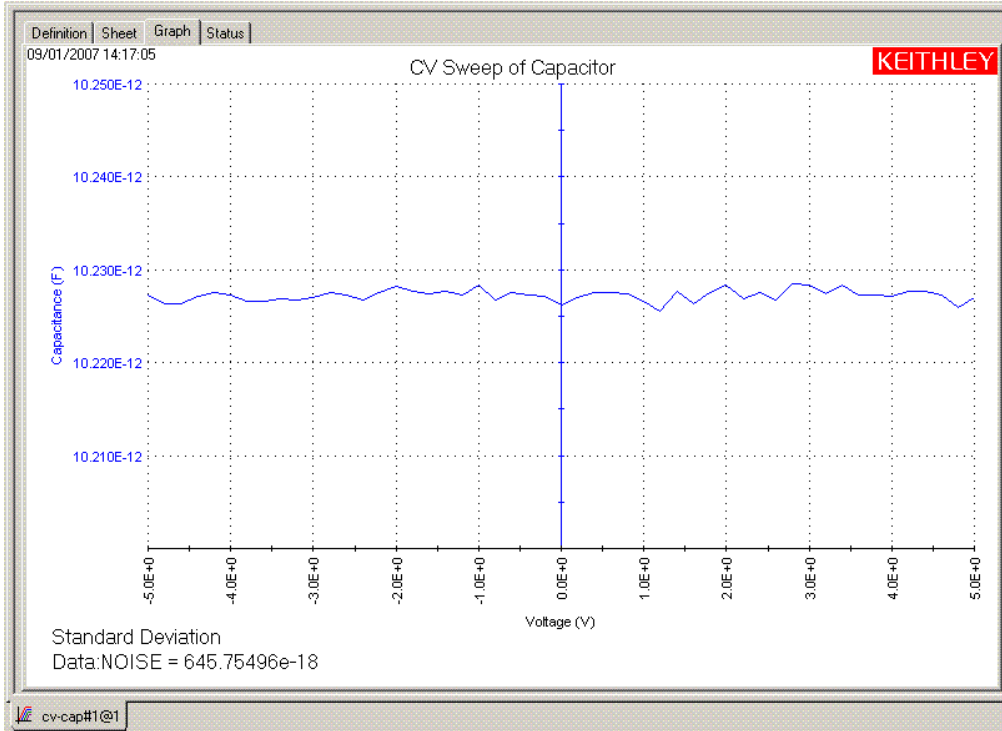
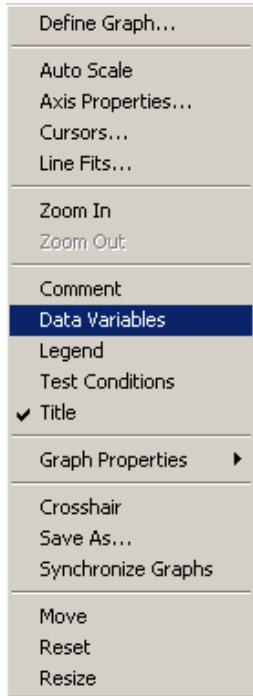


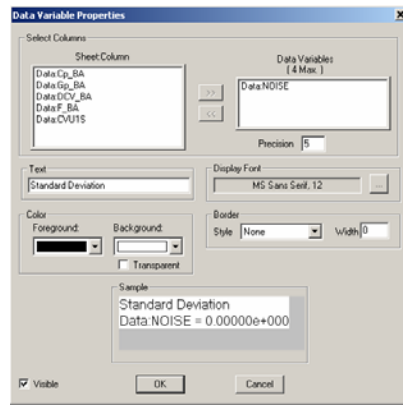
Figure 13: Graph Settings menu



To display the Graph Settings menu: Right-click your mouse anywhere in the graph area.

OR

From the **Tools** menu, select **Graph...Settings**.



Use the **Data Variables** properties dialog box to display extracted parameters – NOISE in this case

Auto Y-axis

By default, the Y-axis does not automatically scale. To automatically achieve optimum resolution for the Y-axis, select auto scale as follows:

1. Right-click anywhere on the graph to display the graph settings menu shown in Figure 13.
2. In the menu, click **Auto Properties** to display the Axis Properties window.
3. Click the **Y1 Axis** tab, and then click **Auto Scale** to insert a check mark in the box for Auto.
4. Click **OK** to close the window and enable auto scale for the Y-axis.

Step 10: Print and export data

Printing Sheet data

1. In the KITE workspace, click the **Sheet** tab to display test data. You can selectively print the **Data** sheet, **Calc** sheet, and/or the **Settings** sheet. Figure 11 and the NOTE that follows it show how to select sheets for printing.
2. From the **FILE** menu (at the upper left side of the KITE window), select the **Print** option.
3. In the **Print** setup window, there are two print options. You can print the **Selected Sheet(s)** (Data, Calc, and/or Sheet) or the **Entire Workbook** (Data, Calc, and Sheet).
4. In the **Print** setup window, click **OK** to print the data.

Printing the graph

1. In the KITE workspace, click the **Graph** tab to display the graph.
2. From the **FILE** menu (at the upper left side of the KITE window), select the **Print** option.
3. In the **Print** setup window, click **OK** to print the graph.

Exporting data into a Microsoft® Excel-compatible worksheet

1. In the KITE workspace, click the **Sheet** tab to display the test data.
2. In the Sheet tab, click the **Save As** button as shown in Figure 11.
3. From the **Save As** setup window, specify a file name and path and click **Save**. The default directory path for exporting data is C:\S4200\kiuser\export.

Additional projects for the Model 4200-CVU

The following additional projects have been created for the Model 4200-CVU are located in the “_CV” folder in the Projects directory:

CVU_BJT	CVU_Capacitor	CVU_InterconnectCap
CVU_ivcvswitch	CVU_lifetime	CVU_Mobilelon
CVU_MOScap	CVU_MOSFET	CVU_nanowire
CVU_PNjunction	CVU_PVcell	

Perform the following steps to open one of the above project plans:

1. Click **File** at the top of the Keithley Interactive Test Environment (KITE) window and select **Open Project** from the drop-down menu.
2. In the Open KITE Project File window, navigate back (up one level) to the **Projects** folder.
3. Double-click the **_CV** folder.
4. Open the desired CVU project.