Metrics ICS Driver Manual

HP4275

Metrics ICS

Version 4.5

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The HP4275 Instrument Driver

Getting Started: Creating and Executing a Test Setup

This section will walk you through the steps required to create and execute a test setup that measures the capacitance of a reversed-biased diode as a function of voltage. This measurement was completed using the HP4275A Multi-Frequency LCR Meter along with the HP16047A Test Fixture. This is simple measurement, but it will provide you with a general understanding of how ICS and the HP4275 are used to measure device characteristics.

Step 1: Connect a Test Fixture or Cable Set to the Instrument

The capacitance example presented in this section was executed using the HP16047A Test Fixture. Set the CABLE LENGTH switch to "0" if you are using the HP16047A or any other test fixture that connects directly to the instrument UNKNOWN terminals. If using standard 1m cables, set the CABLE LENGTH switch to "1m". Any other cable length will induce inaccuracies that must be accounted for. Refer to Chapter 3 of the HP4275A Operating Manual for more information concerning cable length limitations.

Step 2: Connect the HP4275 Instrument Driver

The HP4275 Driver is connected in the Connect Instruments dialogue box. The Connect Instruments dialogue box is accessed by choosing the CONNECT INSTRUMENTS toolbar button or by selecting INSTRUMENTS/SELECT INSTRUMENT from the main menu bar.

How to Connect the HP4275 Driver:

1. Click the CONNECT INSTRUMENTS toolbar button or select INSTRUMENTS/SELECT INSTRUMENT from the measurement mode menu bar. This will open the Connect Instruments dialogue box.
2. Highlight the HP4275 Driver in the AVAILABLE field.
3. Click the CONNECT button.
4. Your choice will be displayed in the SELECTED field.
5. Clicking the OK button would close the Connect Instruments dialogue box and restore control to the ICS desktop. Keep the Connect Instruments dialogue box displayed for now, because the next step requires you to click the Connect Instruments CONFIG button.

Step 3: Designate the GPIB Address and Instrument Options

The HP4275 must include Option 101 (the HP-IB Compatibility hardware) in order to function in a ICS environment. Connect the instrument to your computer using a standard IEEE-488 Bus. The HP-IB designation is Hewlett-Packard's implementation of the IEEE-488 Standard Digital Interface for programmable instrumentation. Please refer to Chapter 3 of the HP4275A Operating Manual to review the hardware details of HP-IB interface control.

The HP4275 Configuration dialogue box is used to designate the instrument's GPIB address along with the hardware options installed in the instrument. The options available with the HP4275 include: a low-voltage variable dc bias supply, a high-voltage variable dc bias supply, battery memory backup, and a 1-3-5 step test-frequency generator. All hardware options must be designated in the HP4275 configuration dialogue box in order to control these options from ICS. Designate the hardware options by selecting the applicable switches.

How to Designate the HP4275 GPIB Address and Instrument Options:

1. The Connect Instruments dialogue box should still be displayed from the last step. If it isn't, click the toolbar CONNECT INSTRUMENTS button or select INSTRUMENTS/SELECT INSTRUMENT from the main menu bar. This will re-open the Connect Instruments dialogue box.
2. Open the HP4275 Configuration dialogue box by clicking the CONFIG button at the bottom of the Connect Instruments dialogue box.
3. Enter the HP4275 GPIB address in the GPIB field. The GPIB address can be read from the instrument's front panel "Display A" field during instrument power up. The GPIB address is displayed following the "P" check and is preceded by an "H". For example, "H09" will be displayed when the GPIB address is set to 9. If you wish to change the GPIB setting, please refer to Chapter 3 of the HP4275A Operating Manual.
4. Designate each hardware option by selecting the respective switch.

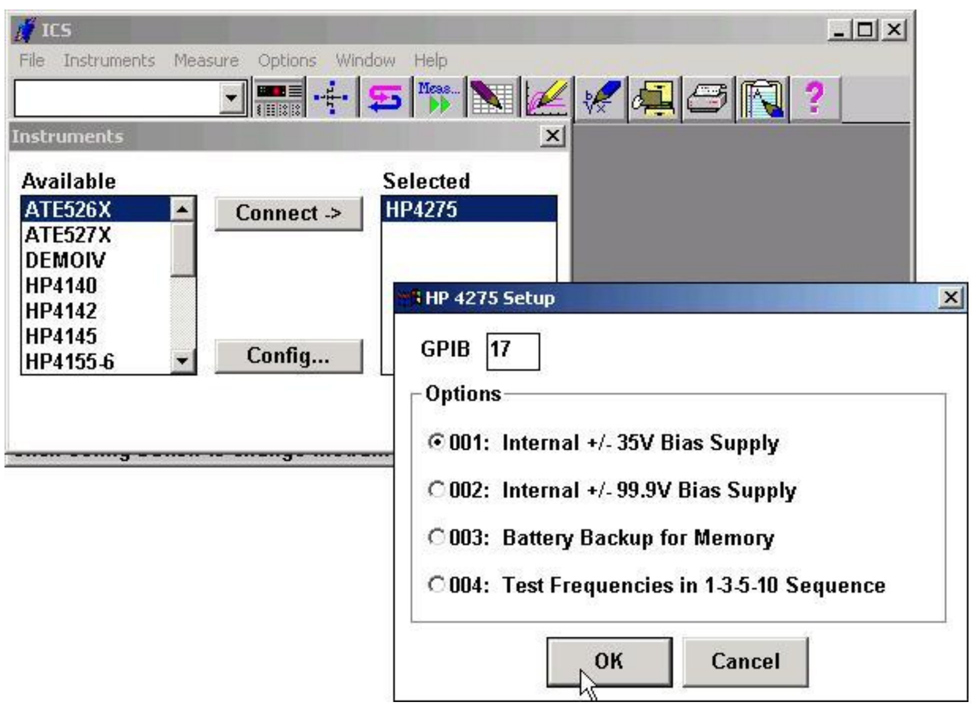


Figure 1: How to Define the HP4275 GPIB Address

<u>Step 4: Calibrate the Instrument</u>

The parasitic effects of the test fixture or test leads introduce device measurement inaccuracies. To eliminate this problem, the HP4275 includes a Zero Offset Adjustment function that compensates for the LCR characteristics inherent to the test fixture or test leads. The Zero Offset Adjustment function is controlled from the Calibration dialogue box. Calibrate the instrument as described below.

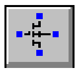
How to Calibrate the HP4275:

1. Open the Calibrate dialogue box by clicking the Setup Editor OPTIONS button.
2. Select the Open switch and click the CALIBRATE button. ICS will display a message reminding you to turn the OSC Level knob fully clockwise. Make certain there is no DUT in the test fixture. Click OK. The Calibrate dialogue box will remain displayed while the Zero Open function is performed.
3. After completing the Zero Open function, select the Short switch and click the CALIBRATE button. ICS will again display a message reminding you to turn the OSC Level knob fully clockwise. Short the test fixture HIGH and LOW terminals. Click OK. The Calibrate dialogue box will remain displayed while the Zero Short function is performed.
4. The instrument is successfully calibrated. Remove the short between the test fixture HIGH and LOW terminals. Click the CLOSE button to restore control to the Setup Editor.

The procedure outlined above is a presentation of the minimal calibration requirements necessary for the CV measurement specified in the example test setup. For a thorough discussion of the Zero Offset Adjustment function, refer to *The HP4275 Calibration Dialogue Box* later in this chapter.

Step 5: Create the Test Setup

Test setups are created in the Setup Editor. Open the Setup Editor by selecting the SETUP EDITOR toolbar button. This example will demonstrate how to define a test setup that measures the capacitance of a reverse-biased diode as a function of voltage.



Click the corresponding toolbar button to display the Setup Editor.

Step 5A: Specify the Test Setup Name

When creating a new test setup, a test setup name must be specified before any other selections or conditions are designated.

How to Specify the Test Setup Name

1. Click the Setup Editor NEW button. This will open the New Setup dialogue box.
2. At the prompt, specify a test setup name. For this example, type "CV".
3. Click OK. This will close the New Setup dialogue box.
4. The test setup name will appear in the Setup Editor SETUP window.

Step 5B: Select a Device Schematic Corresponding to the DUT

A device schematic is located at the center of the Setup Editor. ICS provides a library of different device schematics. Select a schematic that is a representation of the DUT.

The device schematic does not have to match the pin layout of the Device Under Test. The device schematic is provided as a convenience for the user so that the user can document the terminal connections required for the corresponding test setup.

A MOSFET schematic will appear at the center of the Setup Editor when the Setup Editor is first opened. In this step the MOSFET schematic will be replaced with a diode schematic. The MOSFET device is the default Setup Editor schematic. To change the default device schematic, refer to *Chapter 2: The Setup Editor*.

How to Select a Device Schematic:

1. Click the Setup Editor DEVICE button. This will open the Device dialogue box.
2. The Device Type window will display a list of available device schematics. Select "DIODE". Notice the selected schematic is previewed in the small window to the right of the Device Type window.
3. Selecting the DIODE schematic will display a set of polarity switches. Click the "NP" designation.
4. Click OK. This will close the Device dialogue box and display the diode schematic at the center of the Setup Editor.

Step 5C: Designate the Instrument/DUT Connections

The connections between the instrument UNKNOWN terminals and the device under test are designated in the Setup Editor. The Setup Editor display is provided as a tool to document the test fixture or test lead connections required for the corresponding device measurement. The connections designated in the Setup Editor must correspond to the orientation of the DUT in the test fixture or the connections between the DUT and the instrument test leads.

The Setup Editor should display a device schematic that is representative of the device under test (refer to the last step, if necessary). Connections are designated by first clicking either the "high" or "low" source listed in the Source Units dialogue box. After the source is selected, click the blue pad next to one of the device schematic pins. An instrument icon, along with the name of the connected source, will appear above the device schematic pin as a means of indicating the connection.

The instructions presented below will outline how to designate the connection between the HIGH terminals and the diode cathode, along with the connection between the LOW terminals and the diode anode.

How to Designate the Instrument/DUT Connections:

1. Select the Setup Editor SOURCES button. This will open the Source Units dialogue box.
2. The Source Units dialogue box will display two sources. One of the sources is designated "high" and the other "low" (HP4275.CMH and HP4275.CML respectively).
3. Click on the "HP4275.CMH" designation.
4. Designate the intended orientation of the DUT in the HP16047A Test Fixture by clicking the blue pad next to the diode cathode.
5. Select the "HP4275.CML" designation and click the blue pad next to the anode. An instrument icon will appear above both designated connections.
6. Close the Source Units dialogue box by double-clicking the "-" in the upper left-hand corner of the dialogue box.
7. If a DUT connection is mistakenly designated, undesignate the DUT connection as described in *Chapter 2, Removing Instrument/DUT Conections.*

Step 5D: Specify the Setup Configuration of the Instrument

The front panel configuration of the HP4275 is controlled from the HP4275 Setup dialogue box. The HP4275 Setup dialogue box is opened by clicking the instrument icon next to the "CMH" connection.

In this example, the HP4275 will source a 0.25V 1MHz signal while applying a reverse-biased voltage sweep across the junction of an NP diode. The voltage bias will sweep from 0.0V to 5.0V and consist of 51 data points. Capacitance (C), Dissipation Factor (D), and bias voltage (V) will be returned as data.

How to Specify the Instrument Setup Configuration:

1. Click once on the "CMH" instrument icon to open the HP4275 Setup dialogue box.
2. Configure the controls as shown in Figure 2. Use the mouse or TAB key to move between the different switches and fields.
3. Click OK to close the HP4275 Setup dialogue box.

NOTE	The test signal amplitude cannot be controlled from the HP4275 Setup dialogue box. The test signal amplitude must be configured from the front panel of the instrument. This procedure is described in the next step.

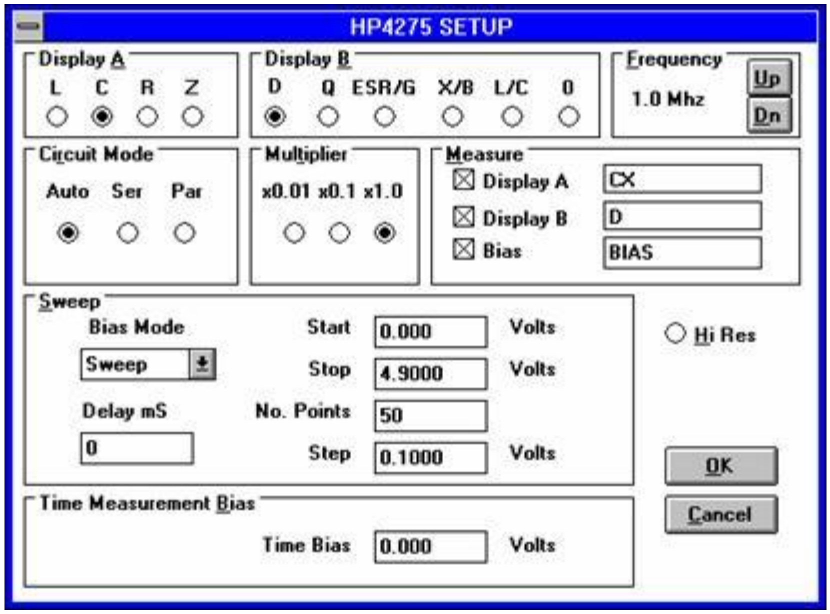


Figure 2: HP4275 Setup Configuration for the CV Test Setup

Step 5E: Adjust the Test Signal Amplitude

The HP4275 does not include the necessary firmware to remotely control the test signal amplitude. While the test signal FREQUENCY level and the MULTIPLIER scale are designated from the HP4275 dialogue box, the test signal amplitude must be designated by adjusting the OSC Level knob on the front panel of the HP4275. The front-panel Signal Level Check function is inoperable when the instrument is under GPIB control. Configure the test signal amplitude by adjusting the OSC Level knob relative to the scale printed on the front panel.

NOTE

The specifications designated in the HP4275 Setup dialogue box will not be applied to the instrument until the measurement is executed. For this reason, the front panel may indicate a MULTIPLIER selection that is different from the specification designated in the HP4275 Setup dialogue box. Ignore the MULTIPLIER selection indicated on the front panel. Adjust the test signal amplitude according to the MULTIPLIER selection designated in the HP4275 dialogue box.

Step 6: Insert the DUT into the Test Fixture

Insert the DUT into the test fixture sockets according to the DUT connections designated in the Setup Editor. For the "CV" measurement described in this section, insert an NP diode into the HP16047A Test Fixture with the cathode inserted at the HIGH socket.

Step 7: Execute the Measurement

Execute the test setup by clicking the toolbar MEASURE button to open the Measurement Remote Control. Select the measurement type and execute the measurement.

If the instrument has not been calibrated as described in Step 4, the HP4275 Calibrate dialogue box will be displayed in the center of the desktop. This is meant to remind the user that the instrument should be calibrated prior to executing a measurement. If you choose not to calibrate the instrument, click the CLOSE button to continue with the measurement. If you wish to calibrate the instrument, follow the procedure presented earlier in *Step 4: Calibrating the Instrument.* If you calibrate the instrument after clicking the toolbar MEASURE button, the measurement will continue automatically after the Calibrate dialogue box is closed.

Step 8: View the Results

Data is automatically written to the corresponding data window spreadsheet each time the measurement is executed. To display the numerical data, double-click on the white spreadsheet icon labeled "CV" at the bottom of the ICS desktop. The spreadsheet was created after the "CV" test setup name was specified in the Setup Editor, but it contained no data.

Data window spreadsheets are dynamically linked to the test setup. Each time the corresponding test setup is executed, the spreadsheet data is replaced with the most recently measured data. For this reason the data window spreadsheet is automatically named the same as the test setup.

Step 9: Create a Plot of the Results

A plot window is dynamically linked to a corresponding data window spreadsheet. This means that the plot is regenerated any time there is a change to the corresponding spreadsheet data. If the test setup is executed more than once, the plot window is regenerated after each measurement. If the data window spreadsheet is edited, the plot window is updated by clicking the REDRAW button at the top of the spreadsheet. Up to ten plots can be created from a single data window spreadsheet, and each plot can be independently formatted.

The steps below will show you how to create a plot of capacitance and dissipation factor with respect to the reverse-biased voltage sweep. This plot will correspond to the CV data just measured.

How to Create a Plot

1. If there is more than one defined test setup, designate the active test setup in one of two ways:
2. Click once on the appropriate data window spreadsheet icon. Clicking once on a data window spreadsheet icon will display a system menu. Ignore this display and proceed with Step 4.
3. Click the toolbar setup window arrow and select the desired setup from the displayed drop-down list.
4. Click the NEW PLOT toolbar button. This will open an empty plot window and the Plot Data dialogue box.
5. Designate the independent variable of the plot by double-clicking on the appropriate data vector listed in the Data window. Three quantities were measured in the CV test setup: capacitance, dissipation factor, and voltage. There should be three data vectors in the dialogue box Data window: "C", "D", and "V" (according to the data vector labels specified in Figure 2). This example will create a plot of capacitance and dissipation factor with respect to the reverse-biased voltage sweep. Since voltage will be the independent variable, double-click on "V". Notice that the X-button is now labeled with a "V".
6. Designate a dependent variable by double-clicking the appropriate data vector in the dialogue box Data window. For this example, double-click on the "C". Notice that the Y1-button is now labeled with a "C".
7. Designate a second dependent variable by double-clicking on the "D". Notice that the Y2-button is now labeled with a "D".
8. You could plot up to eight more data vectors with respect to the independent variable if more data vectors were measured. You can

measure more than ten data vectors, but only ten data vectors can be plotted in a single plot window.

9. Click the dialogue box APPLY button. This will create the plot but will not close the Plot Data dialogue box.
10. Click the CLOSE button to close the Plot Data dialogue box.

<u>Step 10: Save the Results into a Project File</u>

A project file includes all of the information necessary to execute a test setup or group of test setups. A single project file includes: 1) the instrument driver selection, 2) any defined test setup(s), and 3) all of the data and plot windows associated with the test setup(s). For more information about project files, refer to *Chapter 1: How ICS Stores Information*.

The HP4275 Setup Dialogue Box

ICS enhances the functionality of the HP4275 Multi-Frequency LCR Meter by providing the capability to generate LCRZ curves in response to bias voltage sweeps. ICS provides the capability of configuring the HP4275 to source a constant bias or a staircase sweep bias. ICS allows the user to define a bias sweep that consists of up to 2048 data points. Under ICS control, the HP4275 can measure a characteristic curve with the click of a single toolbar button. This capability eliminates the need for the user to compile a response plot by manually incrementing the HP16023B Bias Controller.

Most of the functionality of the HP4275 can be controlled from the HP4275 Setup dialogue box. The HP4275 firmware does not include the capability to remotely control the instrument's mechanical switches. These switches must be configured from the front panel. Some controls available from the instrument's front panel are no longer relevant when controlling the HP4275 in a ICS environment. These controls include: REF VALUE, LCRZ RANGE, and TRIGGER. The functionality provided by these controls are provided in the main body of ICS.

The HP4275 includes two sources: HIGH and LOW. These sources are designated as HP4275.CMH and HP4275.CML respectively in the Source Units dialogue box. HP4275.CMH is the source from which the HP4275 configuration is specified. HP4275.CML is a ground reference.

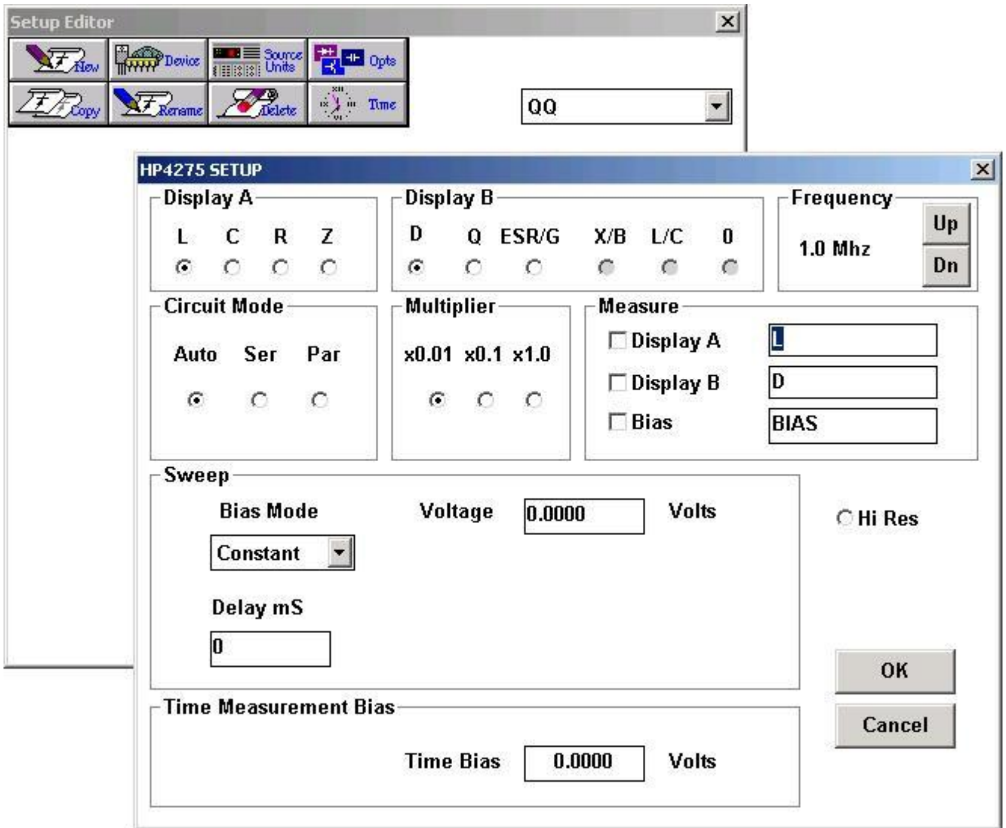


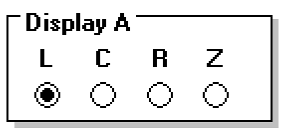
Figure 3: The HP4275 Setup Dialogue Box Shown with the Setup Editor.

The HP4275 instrument configuration is specified in the HP4275 Setup dialogue box. The HP4275 Setup dialogue box is opened by clicking the instrument icon displayed above the HP4275.CMH connection designated in the Setup Editor.

1. **Display A Controls:** The Display A controls are used to designate the primary component-parameter that will be measured by the instrument. The primary designation determines the availability of the subordinate designations listed in Display B.
2. **Display B Controls:** The Display B controls are used to designate the subordinate component-parameter that will be measured by the instrument. The availability of each subordinate component-parameter is a function of both the primary designation and the circuit mode designation.
3. **Frequency Controls:** The Frequency controls are used to designate the frequency of the test signal.
4. **Circuit Mode Controls:** The Circuit Mode controls are used to select a series or parallel equivalent circuit.
5. **Multiplier Controls:** The Multiplier controls are used to select the scale of the test signal amplitude.

6. **Measure Controls:** The Measure controls are used to designate the parameters or bias value(s) that will be returned as data. The Measure controls also include the fields necessary to specify a label for each returned specification.
7. **Sweep Controls:** The Sweep controls are used to designate the configuration of the internal dc bias supply. The Sweep Controls are not relevant to the configuration of the HP4275 unless the HP4275 includes Option 001 or 002. The Sweep Controls will not control an external dc bias supply.
8. **Hi Res Switch:** The Hi Res switch is used to configure the HP4275 in high resolution mode.
9. **Time Measurement Bias:** The Time Measurement Bias value indicates the source value to be used during ICS Time measurements.

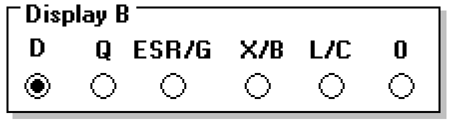
Display A Controls



The Display A Controls are used to designate the primary component-parameter that will be measured by the instrument. The parameter designated in Display A and the selection designated in the Circuit Mode controls determine the availability of the subordinate designations listed in Display B. Refer to Chapter 3 of the HP4275A Operating Manual to review the correlation between primary, subordinate, and circuit mode designations.

In an ICS environment, there is a distinction between measuring a designated parameter and returning the measured parameter as data. When a measured parameter is returned as data, the parameter measurement(s) will be written to a data window spreadsheet. When a parameter is selected in Display A or Display B, the instrument will be configured to measure the designated parameter only. To write the designated parameter to a data window spreadsheet, select the appropriate Measure switch.

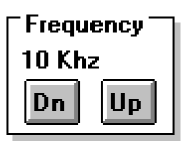
Display B Controls



The Display B controls are used to designate the subordinate component-parameter that will be measured by the instrument. The availability of each subordinate component-parameter is a function of the primary component-parameter designated in Display A as well as the designation selected in the Circuit Mode controls. Refer to Chapter 3 of the HP4275A Operating Manual to review the correlation between primary, subordinate, and circuit mode designations.

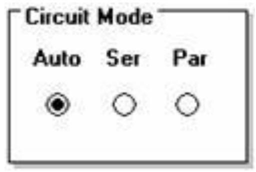
In an ICS environment, there is a distinction between measuring a designated parameter and returning the measured parameter as data. When a measured parameter is returned as data, the parameter measurement(s) will be written to a data window spreadsheet. When a parameter is selected in Display A or Display B, the instrument will be configured to measure the designated parameter only. To write the designated parameter to a data window spreadsheet, select the appropriate Measure switch.

Frequency Controls



The Frequency controls are used to designate the frequency of the test signal. A frequency is selected from a range of available frequencies. To designate a frequency, click the DN and UP buttons as necessary.

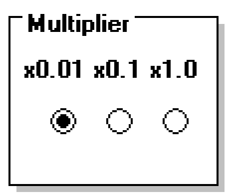
Circuit Mode Controls



The Circuit Mode controls are used to select a series or parallel equivalent circuit. If AUTO is selected, the instrument will automatically select the equivalent circuit. The instrument will select an equivalent circuit based upon the range and function settings.

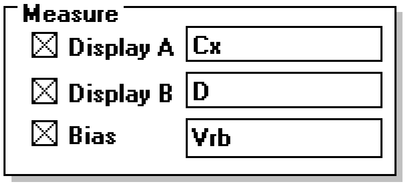
The circuit mode designation, along with the designated primary component parameter, determines the availability of the subordinate parameters listed in the Display B controls.

Multiplier Controls



The Multiplier controls are used to select the scale of the test signal amplitude. While the multiplier scale is designated from the HP4275 Setup dialogue box, the HP4275 firmware does not include the capability to programmatically designate the test signal amplitude. The test signal amplitude must be adjusting by varying the OSC LEVEL knob on the front panel.

__Measure Controls__



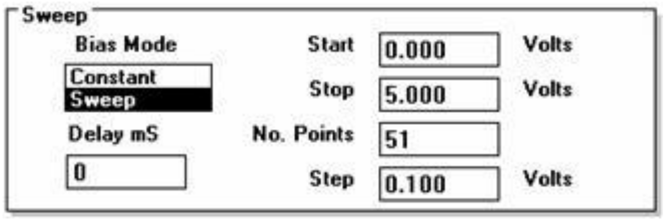
The Measure controls are used to designate the parameters that will be returned as data. The Measure controls also include the fields necessary to specify a label for each returned parameter.

In a ICS environment, there is a distinction between measuring a designated parameter and returning the measured parameter as data. When a measured parameter is returned as data, the parameter measurement(s) will be written to a data window spreadsheet. When a parameter is selected in Display A or Display B, the instrument will be configured to measure the designated parameter only. To write the designated parameter or bias value(s) to a data window spreadsheet, select the appropriate Measure switch.

Labeling Measured Data

All of the data that corresponds to a single curve or spot measurement is collectively referred to as a "data vector". Each data vector is identified by a "data vector label" that must be defined in the text field to the right of the DISPLAY A, DISPLAY B, or BIAS switch. A data vector label can be any alphanumeric string up to twelve characters in length.

Sweep Controls



The Sweep controls are used to designate the configuration of the internal dc bias supply.

The Sweep Controls are not relevant to the configuration of the HP4275 unless the HP4275 includes Option 001 or 002, the low-voltage or high-voltage internal dc bias supply. The Sweep Controls will not control an external bias source.

ICS enhances the functionality of the HP4275 Multi-Frequency LCR Meter by providing the capability to generate LCRZ curves in response to bias voltage sweeps. ICS provides the capability of configuring the HP4275 to source a constant bias or a staircase sweep bias. ICS allows the user to define a bias sweep that consists of up to 2048 data points. Under ICS control, the HP4275 can measure a characteristic curve with the click of a single toolbar button. This capability eliminates the need for the user to compile a response plot by manually incrementing the HP16023B Bias Controller.

Constant Mode

The Constant Mode sources a constant dc bias voltage resulting in a single-point spot measurement.

How to Configure the HP4275 Bias Supply in Constant Mode

1. Select the "CONSTANT" option in the Bias Mode field. Click the scroll-arrow at the right end of the Bias Mode field to display the "CONSTANT" and "SWEEP" options. Click the "CONSTANT" designation.
2. Specify a bias signal amplitude in the amplitude field. Highlight the present value and specify a new value directly.

3. If desired, specify a trigger delay in the Delay field. The value specified in the Delay field will be read as milliseconds.

Sweep Mode

The staircase sweep bias mode allows the user to generate parameter curves as a function of voltage with the click of a single button. The staircase sweep enhancement provided by ICS exceeds the functionality available with the HP16023B Bias Controller. The HP16023B Bias Controller requires the user to manually increment each forcing value. Under ICS control, the need for the HP16023B Bias Controller is eliminated. ICS provides the capability to configure the HP4275 to source a staircase sweep bias signal consisting of up to 2048 data points. The sweep bias is fully defined by specifying three of the four sweep parameters: START, STOP, NO. POINTS, and STEP size.

How to Configure the HP4275 Bias Supply in Sweep Mode

1. Select the "SWEEP" option in the Bias Mode field. Click the scroll-arrow at the right end of the Bias Mode field to display the "CONSTANT" and "SWEEP" options. Click the "SWEEP" designation. Selecting the SWEEP designation will display a set of definition fields specific to the bias sweep mode.
2. Specify the starting value of the bias signal in the START field. Highlight the present value and specify a new value directly.
3. Hit the TAB key once or use the mouse to advance to the STOP field. If desired, specify a stop value for the bias sweep. If the STEP size field is specified by the user, or if any other field is edited by the user after the bias sweep is fully defined, the STOP field will be updated automatically to accommodate the change.
4. Hit the TAB key once or use the mouse to advance to the NO. POINTS field. Specify the number of data points that will comprise the bias sweep signal. The data point quantity is also the number of measurements the resultant parameter curve will consist of.
5. If necessary, hit the TAB key once or use the mouse to advance to the STEP size field. The STEP size designates the magnitude by which the bias signal will be incremented as it steps through the sweep. If the START, STOP, and NO. POINTS fields have been designated, the STEP size field will be calculated automatically.
6. If desired, specify a trigger delay in the Delay field. The value specified in the Delay field will be read as milliseconds.

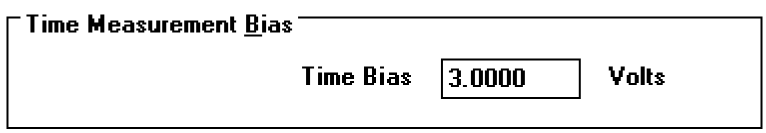
Delay Time

The Sweep controls delay function allows you to designate a trigger delay. A trigger delay is the length of time the HP4275 will wait before executing a measurement after the instrument has been triggered from the ICS toolbar. The delay value must be specified in milliseconds. There is no limit to the specified delay time other than the limitation imposed by the field size. The delay function is a capability enhancement provided by ICS. A delay time cannot be set from the front panel of the instrument.

Hi Res Switch

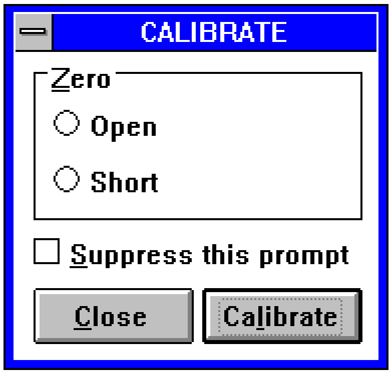
The Hi Res switch is used to configure the HP4275 in high resolution mode. When configured in high resolution mode, the HP4275 will enhance the measurement resolution by returning an averaged result after every ten measurements

Time Measurement Bias



The Time Measurement Bias value indicates the source value to be used during ICS Time measurements.

The HP4275 Calibration Dialogue Box



The parasitic effects of the test fixture or test leads introduce device measurement inaccuracies. To eliminate this problem, the HP4275 includes a Zero Offset Adjustment function that compensates for the LCR characteristics inherent to the test fixture. The Zero Offset Adjustment function is controlled from the Calibration dialogue box. The Calibration dialogue box is displayed by clicking the Setup Editor OPTIONS button.

The calibration functions are controlled from the Calibration dialogue box. The Calibration dialogue box can be displayed by clicking the Setup Editor OPTIONS button.

If a measurement is executed without first calibrating the instrument, the Calibrate dialogue box will be displayed in the center of the desktop after clicking the MEASURE button. The appearance of the Calibrate dialogue box is intended to remind the user that the instrument should be calibrated in order to compensate for the parasitic effects of the test fixture or test leads. If you wish to calibrate the instrument, follow the procedure described below. After one or both of the calibration functions are performed, the calibration prompt will no longer be displayed during the current session of ICS. If you choose not to calibrate the instrument, click the CLOSE button to continue with the measurement. If desired, select the Suppress switch before closing the Calibrate dialogue box to suppress any future appearance of the calibration prompt (see *Suppressing the Calibration Prompt* later in this chapter). The feature provides for the use of an uncalibrated instrument without the need to acknowledge the calibration prompt every time a measurement is executed.

Each calibration function must be performed individually. You cannot perform more than one calibration method at a time. To perform a calibration function, designate the desired calibration method by selecting the corresponding switch. Click the CALIBRATE button. The Calibrate dialogue box will remain displayed throughout the calibration process. After the calibration method is completed, the corresponding switch will remain selected as an indication that the calibration method was performed. The calibration switch will remain selected throughout the current session of ICS or until the HP4275 driver is disconnected.

Please refer to Chapter 3 of the HP4275 Operating Manual for a detailed overview of error characteristics and the Zero Offset Adjustment function.

How to Calibrate the HP4275:

1. Open the Calibrate dialogue box by clicking the Setup Editor OPTIONS button. The dialogue box will be displayed automatically if the instrument was actuated without being calibrated.
2. Select the Open switch and click the CALIBRATE button. ICS will display a message reminding you to turn the OSC Level knob fully clockwise. Make certain there is no DUT in the test fixture. Click OK. The Calibrate dialogue box will remain displayed while the Zero Open function is performed. After the Zero Open function is completed, the corresponding switch will remain selected as an indication that the function was performed.
3. After completing the Zero Open function, select the Short switch and click the CALIBRATE button. ICS will again display a message reminding you to turn the OSC Level knob fully clockwise. Short the test fixture HIGH and LOW terminals. Click OK. The Calibrate dialogue box will remain displayed while the Zero Short function is performed. After the Zero Short function is completed, the corresponding switch will remain selected as an indication that the function was performed.
4. The instrument is successfully calibrated. Remove the short between the test fixture HIGH and LOW terminals. Restore the OSC Level knob to its original position. Click the CLOSE button to restore control to the Setup Editor. If you calibrated the instrument after initiating the measurement, the instrument will automatically continue with the measurement after the CLOSE button is selected.

Chapter 3 of the HP4275 Operating Manual instructs you to execute the calibration function with the MULTIPLIER scale set to "x1" in addition to setting the OSC Level knob fully clockwise. You do not have to configure the MULTIPLIER scale when calibrating the HP4275 from ICS. The MULTIPLIER scale is programmatically controlled. The "x1" scale will be selected automatically when ICS executes the calibration function. If the calibration function is performed after a test setup is defined, the MULTIPLIER scale configured in the corresponding HP4275 Setup dialogue box will be restored when the test setup is executed.

Suppressing the Calibration Prompt

If the user selects the toolbar MEASURE button without first calibrating the instrument, ICS will display the Calibrate dialogue box as a reminder to the user that the instrument is uncalibrated. If you wish to continue testing without calibrating the instrument, select the Suppress switch in the Calibrate dialogue box. This feature will suppress any future calibration prompt.

When the Suppress switch is selected, the suppression of the calibration prompt is applied to every test setup in the project file. However, the suppression option will not be preserved if ICS is closed or the HP4275 driver is unloaded.

If the HP4275 is used in a time domain test setup, the calibration prompt will be suppressed automatically while executing the time domain measurement (refer to *Chapter 2, Creating a Time Domain Test Setup*). If a time domain test setup is included in a test sequence, the calibration prompt will be suppressed while executing the time domain measurement but not during any of the static measurements. The status of the calibration prompt during the static test setups is determined by the position of the Suppress switch in the Calibrate dialogue box.

Front-Panel/Back-Panel Designations

The HP4275 does not include the necessary firmware to remotely control the position of the instrument's mechanical switches. The following switches must be configured at the instrument.

DC Bias Selector

The DC Bias Selector switch must be set from the back-panel of the instrument. The DC Bias Selector switch is used to designate the source of the dc bias supply. Refer to Chapter 3 of the HP4275A Operating Manual, if necessary.

Cable Length/DC Bias

The Cable Length and DC Bias switches must be set from the front panel of the instrument. These switches should be configured prior to connecting the test fixture or cable set. Refer to Chapter 3 of the HP4275A Operating Manual, if necessary.

OSC Level (Test Signal Amplitude)

The test signal amplitude must be designated by adjusting the position of the OSC Level knob from the front panel of the instrument. The test signal amplitude should be adjusted after the HP4275 controls are designated in the HP4275 Setup dialogue box.

To adjust the test signal amplitude, make certain that the desired test signal FREQUENCY level and the MULTIPLIER scale have been selected in the HP4275 Setup dialogue box. The specifications designated in the HP4275 Setup dialogue box **will not** be applied to the instrument **until** the measurement is executed. For this reason, the front panel may indicate a MULTIPLIER selection or FREQUENCY level that is different from the specification designated in the HP4275 Setup dialogue box. Ignore these front-panel displays and adjust the test signal amplitude according to the MULTIPLIER selection and FREQUENCY level designated in the HP4275 dialogue box.

The front-panel Signal Level Check function is inoperable when the instrument is under GPIB control. Configure the test signal amplitude by adjusting the OSC Level knob relative to the scale printed on the front panel.

Front-Panel Functionality

Some of the functionality provided by the HP4275 is not supported by the HP4275 Instrument Driver. These features are disabled because the same functionality is greatly enhanced by the features available in ICS.

Ref Value

The REF VALUE controls on the front of the instrument do not have any analogous controls in the HP4275 Setup dialogue box. These functions are not supported by the HP4275 Instrument Driver because these same capabilities are provided in the main body of ICS. The functionality provided by selecting the "" and "%" buttons can be duplicated by defining the appropriate expression in the Calculator function. If necessary, refer to Chapter 5: *Data Windows and Data Analysis*.

LCRZ Range

The LCRZ RANGE controls on the front panel of the instrument are not relevant while the instrument is under ICS control. The units displayed on the front-panel display fields are not part of the measured data. All of the measured data is formatted as floating-point numbers and written to a data window spreadsheet. If necessary, data is displayed in scientific notation.