micromeritics®

DVVA II 4000

Dynamic Void Volume Analyzer

Operator's Manual

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1. GENERAL INFORMATION

Organization of the Manual

This manual describes how to operate and maintain the DVVA II 4000 void volume analyzer; it is organized as follows:

Chapter 1 **GENERAL INFORMATION**

Provides a general description and specifications of the DVVA II analyzer.

Chapter 2 **USER INTERFACE**

Provides basic hardware and software interface.

Chapter 3 **OPERATIONAL PROCEDURES**

Provides step-by-step instructions on the operations for the DVVA II analyzer.

Chapter 4 **SOFTWARE AND SETUP MODIFICATION**

Provides instructions for installing software updates and for modifying analyzer setup configurations.

Chapter 5 **FILE MENU**

Provides a description of the commands on the File menu.

Chapter 6 **UNIT MENU**

Provides a description of the commands on the Unit menu.

Chapter 7 **REPORTS MENU**

Provides a description of the commands on the Reports menu.

Chapter 8 **OPTIONS MENU**

Provides a description of the commands on the Options menu.

Chapter 9 **TROUBLESHOOTING AND MAINTENANCE**

Provides troubleshooting and maintenance information.

Chapter 10 **ORDERING INFORMATION**

Provides part numbers and ordering information for system components.

Appendix A **ERROR MESSAGES**

Lists the error messages that may be displayed by the software; includes cause(s) and action(s) for each.

Appendix B **CALCULATIONS**

Contains the calculations used by the software to produce reports.

Appendix C **BULK DENSITY FOR CARBON BLACK**

Provides the bulk density values for the SRB series reference materials.

Index **INDEX**

Provides quick access to a subject matter

Conventions

This manual uses the icons shown below to identify notes of importance, cautions, and warnings.

Notes contain important information pertinent to the subject matter.

Warnings contain information that help you prevent actions that may cause personal injury.

Cautions contain information that help you prevent actions that may damage the analyzer.

Equipment Description

The DVVA (Dynamic Void Volume Analyzer) II 4000 has been designed specifically for the carbon black industry. The DVVA II enables you to determine the occluded pore volume within the primary structure of carbon black using a compression-type method as opposed to the more lengthy oil-absorption methods.

The operation of the DVVA II is simple. A quantity of carbon black is placed into the sample chamber. A piston travels down the chamber, compressing the carbon black against the lower piston. The software, in response to user-input, automatically controls the application of force so that high pressures are achieved with precision. As the piston begins to travel down the chamber and force begins to build, data points are taken at millisecond intervals; force, displacement, and time are automatically recorded.

After analysis is complete, the upper piston drive reverses to release the force on the lower piston. The lower piston retracts, and then the operator swaps the lower piston tray with a waste

disposal tray. The upper piston then advances downward until the carbon black pellet is expelled from the chamber and falls into the waste disposal drawer.

Safety interlocks are provided to prevent the analyzer from operating until the safety shield is lowered over the sample area. The safety shield and interlock system prevent personal exposure to moving parts on the analyzer.

Specifications

The DVVA II 4000 has been tested to meet the specifications listed below.

Characteristic	Specification		
Performance			
Linear displacement transducer:	Accuracy:	0.1% or better	
	Resolution:	0.003 cm (0.001 in.) or better	
	Repeatability:	± 0.1%	
	Reproducibility:	± 0.2%	
Strain gage load cell transducer:	Accuracy:	± 0.25% or better	
	Resolution:	± 5 kg (10 lbs)	
	Repeatability:	± 0.25%	
	Reproducibility:	± 0.5%	
For Tread or Carcass Carbon Blacks*			
Repeatability (r)	Within-instrument repeatability (r): Void Volume at Geometric Mean Pressure of 50 MPa, 75 MPa or 100 MPa		± 1 % of Void Volume Value
Reproducibility (R)	Between-instrument reproducibility (R), normalized: Void Volume at Geometric Mean Pressure of 50 MPa, 75 MPa, or 100 MPa		± 2 % of Void Volume Value
*Based upon results obtained from multiple instruments for ASTM Committee D24 on Carbon Black SRB series 8, utilizing ASTM Practice D4483 for evaluating precision of test results.			

Characteristic	Specification
Physical	
Height:	190 cm (6 ft, 3 in.)
Width:	29 cm (2 ft, 3 in.)
Depth:	79 cm (2 ft, 7 in.)
Weight:	329 kg (725 lbs)
Electrical	
Voltage:	100/120/230 VAC
Power:	1350 VA or less
Frequency:	50 to 60 Hz
Computer	
Minimum requirements:	Pentium P3 500 MHz or equivalent One CD ROM drive USB (2.0) connector 128 megabytes of RAM 2-gigabyte hard drive 1024 x 768 video display capability Windows® 7, Windows XP, or Windows Vista operating system

2. USER INTERFACE

This chapter contains information to familiarize you with the hardware and software of the DVVA II analyzer. It is recommended that you read this chapter before attempting to operate the analyzer.

Controls, Indicators, and Connectors

Front Panel

Fault indicator — Illuminates when an error condition is present; for example, the safety shield may not be in place. The analyzer will not operate until the fault condition is cleared and the **Reset** button pressed.

Active indicator — Illuminates when an automatic operation is in progress

Ready indicator — Illuminates when the analyzer is in a safe state and ready for the next operation

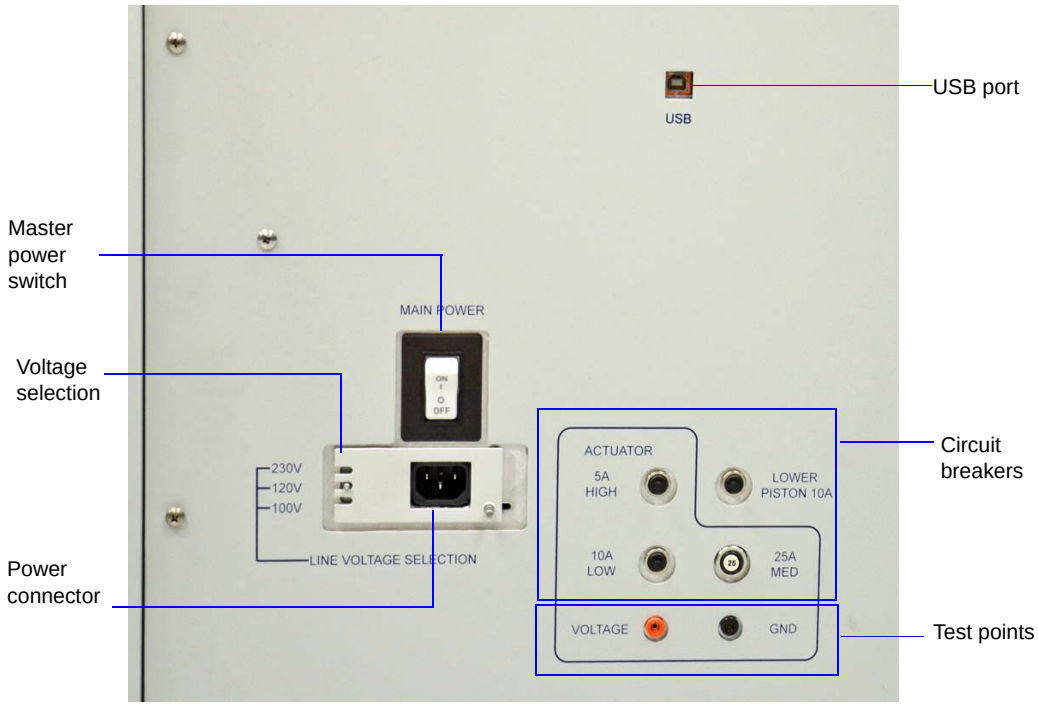
Emergency Stop — This button should be used in the event of an emergency situation. Pressing this button stops all operations immediately, including any analysis that may be in progress.

After an emergency stop, you must perform the following steps before the analyzer is operational again:

- turn the **Emergency Stop** button to the right to release it
- press the **Reset** button

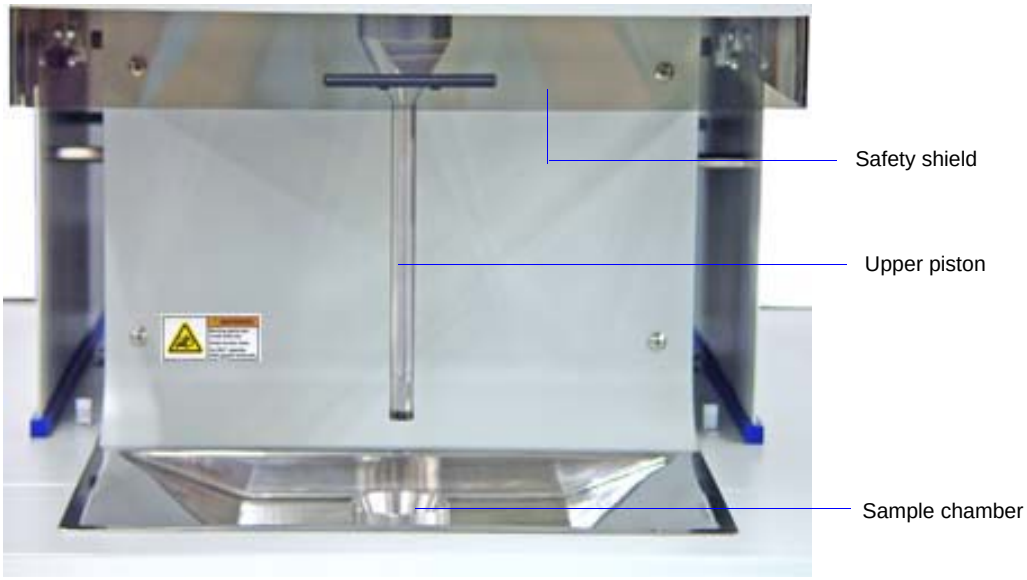
Reset	Enables you to reset the analyzer to a ready state; this button must be pressed every time you close the shield and begin an operation.
Power switch and indicator	Turns the analyzer on and off; the power indicator illuminates when power is on.
Tray drawer	For placement of the lower piston tray (during analysis), and the disposal tray (after analysis) to collect the sample This drawer must be completely closed before the analyzer will operate.

Rear Panel



USB port	For connecting the communications cable to the computer
Voltage selector switch	Enables you to select the correct operating voltage
Power connector	For connecting the power cord
Actuator and lower piston circuit breakers	A trip of one of these breakers may indicate a motor failure. Should this occur, wait a few minutes, reset the breaker, and retry your operation. If the breaker trips again, contact your service representative.
Test points	For service personnel only
Master power switch	Master power for the analyzer

Sample Compartment



The sample compartment contains the sample chamber and the piston, and is enclosed with a safety shield.

Safety shield	This shield slides up to open and down to close. This shield must be in a fully closed position before the analyzer will operate.
Upper piston	Drives the sample down through the chamber for analysis
Sample chamber	The chamber into which the sample is placed for analysis

Safety Warning

This warning label is affixed in various locations on the DVVA II analyzer. Safety interlocks are in place to prevent the pistons from operating when the safety shield is not completely lowered or when the tray drawer on the front of the analyzer is not fully closed.

- Do not attempt to interfere with or modify the safety interlock system
- Do not try to stop the motion of the piston with your hands or with any object
- Do not place your hands or any object in the path of the piston

Any of these actions could cause severe bodily harm or damage to the analyzer.

Turning the System On and Off

So that the presence of all components are recognized, turn the system on and off as follows. It is not necessary to turn on and off the master power switch on the rear panel of the analyzer for normal operations.

When the instrument is being shut down for an extended period of time or is being turned on for the first time or after loss of power, please refer to the "Full Power-On Procedure" on page 9-4

Turning On

1. Turn on the computer.

If the master switch has been inadvertently turned off, or the USB cable disconnected, turn on the master power switch and connect the cable before proceeding to Step 2.

2. Place the On/Off switch on the front panel in the **On** position.
3. Allow approximately 30 seconds for all components to connect to the computer, then start the application.

Turning Off

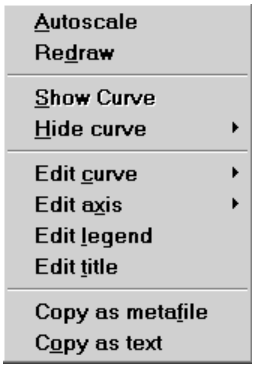
1. Exit the application.
2. Place the On/Off switch on the front panel in the **Off** position.
3. Turn off the computer.

Software

The DVVA II analysis program operates in the Windows environment and requires familiarity with standard Windows operations such as using the mouse, menus, and dialog boxes. This manual provides brief instructions for standard operations. Refer to your Windows documentation or the Windows help system to clarify functions which are specific to Windows.

Shortcut Menus

Shortcut menus (sometimes referred to as pop-up menus) are available for onscreen graphs, tabular reports, and certain components on the instrument schematic. These menus are accessed by right-clicking in the graph or table area, or on components on the instrument schematic. For example, right-click in the graph area of an onscreen report and the following menu is displayed.



You can also use the key combination **Shift + F9** to access the shortcut menu.

Shortcut Keys

Shortcut keys can be used to activate some menu commands. Shortcut keys or key combinations (if assigned) are listed to the right of the menu item. Instead of opening the menu and choosing the command, simply press the key combination. For example, to open a sample information file, press **F2**; the Open Sample Information dialog is displayed.

You can also use shortcut keys to access a menu or any function that contains an underlined letter by pressing **Alt** plus the underlined letter in the command. For example, to access the **File** menu, press **Alt**, then **F**.

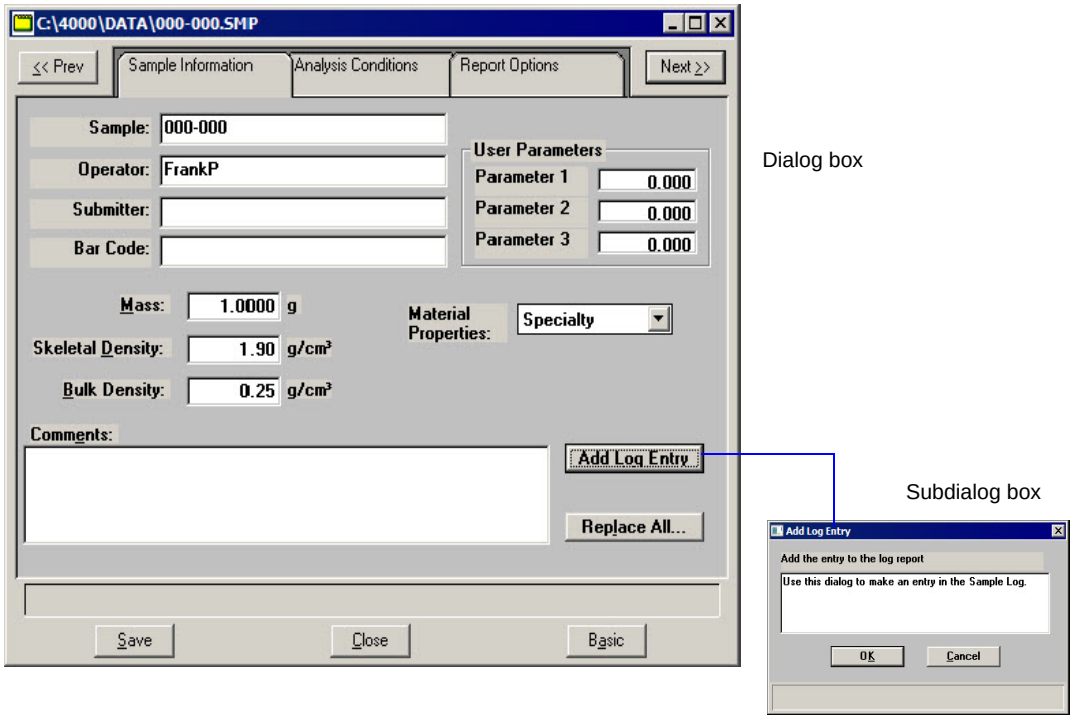
Table 2-1 lists the shortcut keys available for operating the DVVA II 4000 program.

Table 2-1. Shortcut Keys

Key(s)	Function
F1	Access operator's manual
F2	Open a sample information file (main menu bar)
	Clear the field of existing date (Select Dates dialog)
F3	Open an analysis conditions file (main menu bar)
	Insert the current date (Select Dates dialog)
F4	Display a calendar from which to choose a date (Select Dates dialog)
F5	Open a report options file
F6	Tile windows
F7	Cascade windows
F8	Start a report
F9	Close all open reports
Alt + F4	Exit the DVVA II program
Shift + F2	List statistics for sample information files
Shift + F3	List statistics for analysis conditions files
Shift + F5	List statistics for report options files
Shift + F9	Displays the shortcut menu for onscreen reports and for manual control components on the instrument schematic

Dialog Boxes and Subdialog Boxes

Dialog boxes are displayed when an item followed by an ellipsis (...) is selected. Subdialog boxes are displayed when a push button on a dialog box is selected.



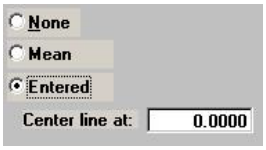
Both types of dialogs may contain one or more of the following:

Data entry field — These fields may be numeric (numbers only) or alphanumeric (numbers, letters, or printable characters).

Push button — Typically, a push button is used to display a subdialog box in which to edit, enter, or specify additional information about the subject matter like the **Add Log Entry** push button shown above. Some push buttons, however, are used to invoke an action; *for example*, **Save** saves entries in the current dialog.

Radio button

Radio buttons allow you to choose one option from a group of two or more.



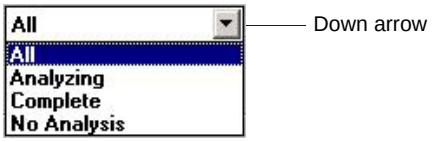
Some radio buttons enable data entry fields in which values are to be entered.

Check Boxes

Check boxes also are used to select options; you may select as many items as you wish.

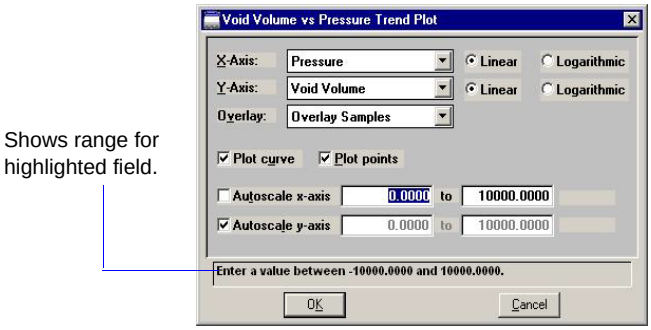
Drop-down lists

A drop-down list is indicated by a down arrow to the right of the field. Drop-down lists contain a list of options from which you may choose one.



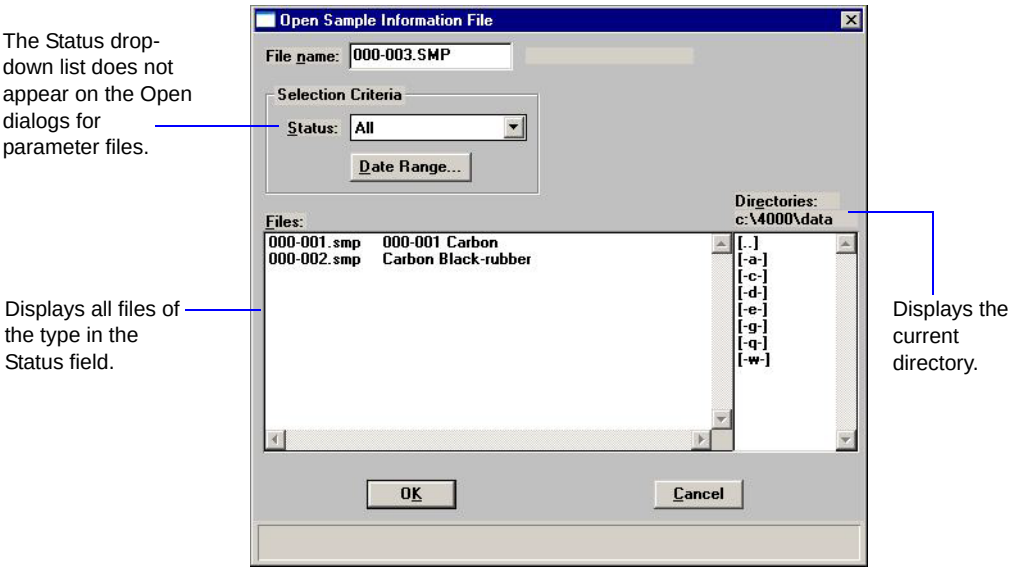
Information Bar

Some dialog boxes contain information pertinent to the selected field in an information bar across the bottom of the dialog. For example, a range is shown for fields in which numeric entries are required.



Selecting Files

Certain dialog boxes contain a **Files** list window which displays a list of files available for the current operation. One example is the Open Sample Information dialog:

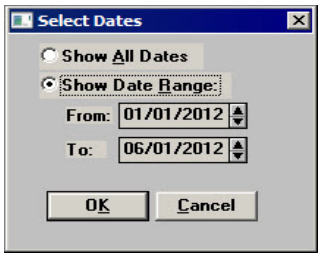


Select the desired file(s) and click **OK**, or simply double-click on the desired file.

You can limit the number of files displayed in the **Files** list window by choosing one (or more) of the following:

- Use wildcard characters in the path name you enter in the **File name** field. Wildcard characters such as * and ? can be used to filter file names. For example, you could filter a list of sample files to display files beginning with **C** by entering **C*.smp** in the **File name** field.

- Enter a range of dates. Click **Date Range**; the Select Dates dialog is displayed.



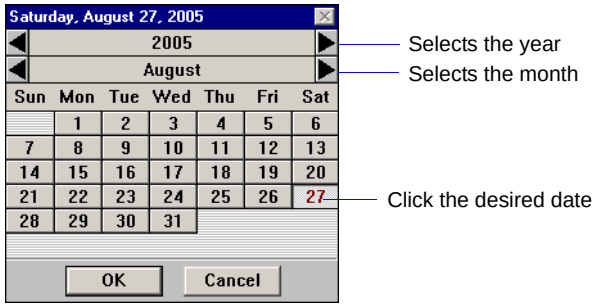
Select the **Show Date Range** radio button to enable the **From** and **To** fields so that you may enter a range of dates in which to display files. Alternatively, you can double-click in each field to display a calendar from which to choose a date. The range you specify remains the default until you change the dates or select **Show All Dates**.

The following shortcut keys are available when the Select Dates dialog is displayed (be sure the cursor is in the appropriate field):

F2 Clears the field

F3 Inserts the current date

F4 Displays a calendar allowing you to select a date



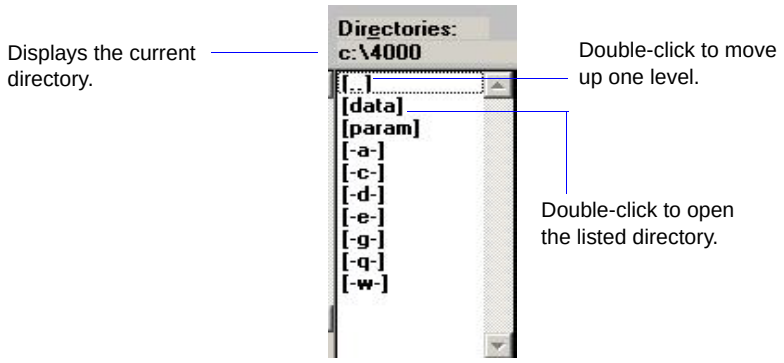
You may change the date format by using the Date and Time function on the Windows Control Panel.

- Select a file status from the Status drop-down list (displays only for sample files).

Table 2-2. File Status and Description

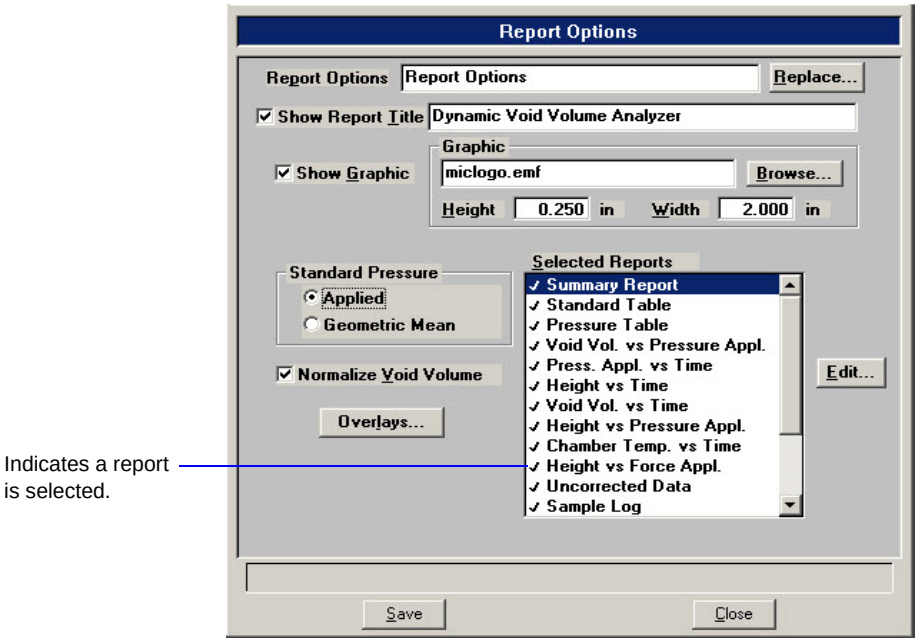
Status	Description
All	All sample information files in the specified directory and within the specified range of dates
Analyzing	Sample information files that are currently being used in an analysis
Complete	Sample information files that have been used in a completed analysis
No Analysis	Sample information files that have not been used in an analysis

- Navigate to a different directory. The current directory is displayed just above the **Directories** list box. You can change directories by double-clicking a directory in the **Directories** list box, double-clicking **[...]** to move up one level, or by entering the desired directory in the **File Name** field. For example, enter C:\4000\files\sample*.smp to display sample files in the **4000files\sample** directory on your local drive.



Selecting Reports

Reports are selected from the Report Options dialog, or any dialog containing a Selected Reports list. Simply highlight the report and double-click, or press the **Spacebar**. A report is selected when it is preceded with a check mark. Reports are deselected in the same manner.



File Name Conventions

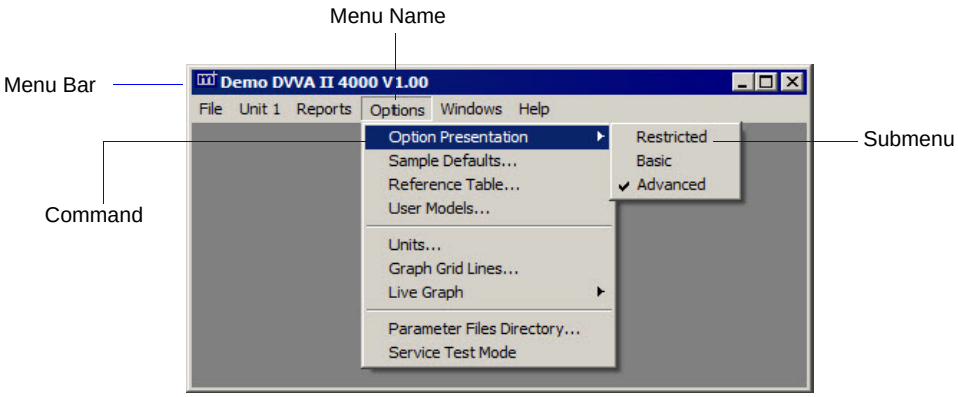
The following table shows the file name extensions for the DVVA II program.

Table 2-3. Default File Name Extensions

File Type	Extension
Sample Information	SMP
Analysis Conditions	ANC
Report Options	RPO
Export (text file)	TXT
Export (spreadsheet)	XLS
Print file contents	LST
List file statistics	LST
The following types are available for reports saved from the Report window:	
Report	REP
Spreadsheet	XLS
ASCII	TXT

Menu Structure

All functions for the DVVA II 4000 program are located on menus which are accessed from the Menu bar. Each menu contains commands, and in some cases a submenu. A submenu is indicated when the command is followed by an arrow.



Brief descriptions of each menu are provided below; refer to the chapter given in parentheses for a detailed description of the commands contained on that menu.

File — The options on the File menu enable you to create and manage sample and parameter files. (**FILE MENU**, page **5-1**)

Unit 1 — Enables you to perform analyses and other instrument operations. (**UNIT MENU**, page **6-1**)

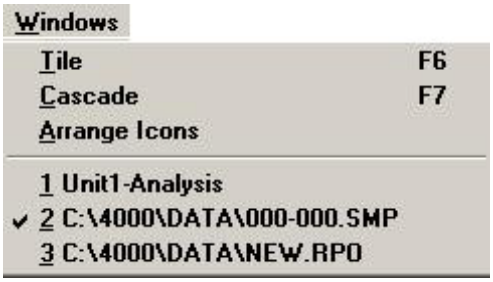
Reports — Enables you to generate, close, and open reports. (**REPORTS MENU**, page **7-1**)

Options — Allows you to choose sample editing mode, edit the sample defaults, edit the reference table, enter user models, select data presentation formats, and specify a location for predefined parameter files. (**OPTIONS MENU**, page **8-1**)

Windows — Enables you to arrange the windows and icons on your screen. This menu also displays the names of all open windows. (page **2-15**)

Help — Displays information about the DVVA II 4000 program. Also provides access to the operator's manual. (page **2-15**)

Windows Menu



Tile Resizes all open windows and arranges them side by side.

Cascade Resizes all open windows and arranges them in a stacked fashion. The active window is positioned on top of the stack. Each window's title remains visible, making it easy to select other windows.

Arrange Icons Arranges all minimized dialogs in an orderly manner.

Open Files Displays all currently open files. The active file is preceded with a check mark.

Help Menu

Operator's Manual Launches Adobe Acrobat, providing a copy of the operator's manual.

About 4000 Displays information about the DVVA II program.

3. OPERATIONAL PROCEDURES

This chapter contains brief step-by-step instructions on how to:

- specify sample file defaults, this page
- create sample information files, page **3-6**
- define parameter files, page **3-9**
- perform an analysis, page **3-15**
- print file contents, page **3-22**
- list statistics on sample or parameter files, page **3-24**
- export data from a sample information file, page **3-26**
- overlay graphs, page **3-27**

This chapter does not contain detailed descriptions of the dialogs used to perform these procedures. Refer to Chapters 5 through 8 for dialog descriptions. Use the index to assist you in locating the appropriate dialog.

Specifying Sample File Defaults

You can specify sample defaults in the Basic or Advanced format. The defaults you specify are the ones you see when you create a new sample file. Therefore, it is best to specify (or enter) parameters that you plan to use most frequently. For example; specify defaults for your most commonly analyzed sample material. You can always edit parameters when you create a file. The DVVA II 4000 application automatically generates sample information file names and uses the values you specify as the defaults.

Advanced Format

The Advanced Sample Defaults dialog consists of tabs for each parameter. Click the tab to move from one set of parameters to another. The values you specify in the parameter portions (Analysis Conditions and Report Options) of the sample file are saved as the defaults for newly created parameter files.

For example, after specifying defaults for a sample file in the Advanced format:

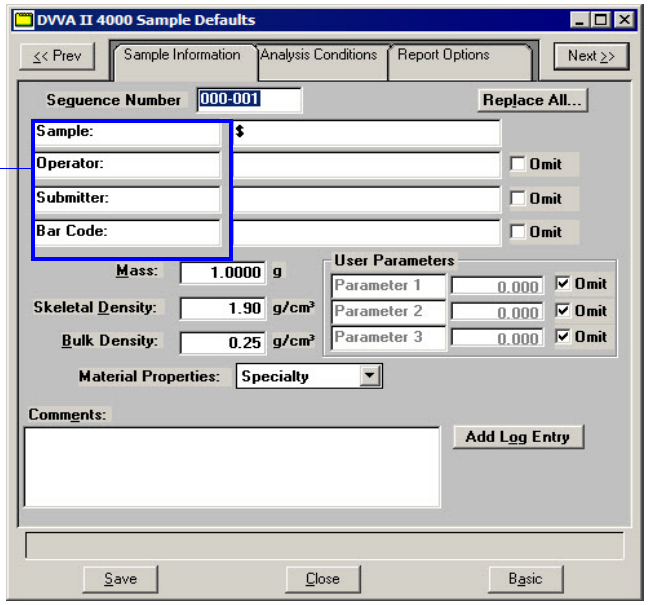
- Select **File > Open > Sample Information**, then **Yes** to create the file, and the defaults you specify display for all parameters.

- Select **File > Open > Analysis Conditions**, name and create the file, and the defaults you specify in the Analysis Conditions portion of the Advanced Sample Defaults dialog display in the fields.

Refer to **Advanced**, page **8-6** for a description of the fields associated with specifying defaults for sample information files in the Advanced format.

1. Select **Options > Sample Defaults**, the Advanced Sample Defaults dialog is displayed.

These labels can be edited. For example, you may wish to use Material in place of Sample.



2. In the **Sequence Number** field, specify a default string for the sample file number; you can use up to eight characters. This is the number that appears in the **File name** field when you select **File > Open > Sample Information**.

3. In the right-side field of the **Sample** line, enter a format for the sample's identification. You can enter up to 42 characters. Include the $ symbol if you want the sample file number (**Sequence**) included as part of the identification.

You also can edit the word *Sample*. For example, you may prefer to use *Material* or *Test*. You can enter up to 15 characters in this field.

4. Edit the **Operator** and **Submitter** lines if desired. Select **Omit** to remove them from the sample file editor.

5. The **Bar Code** field enables you to enter bar code information. If bar code information is not used, you can use this field to enter additional information about the sample; for example, you may wish to enter the lot number of your sample.

   This field, as well as other fields on the dialog, accepts data from a bar code reader. A bar code reader can be attached to one of the USB connectors on the computer. Simply scan the bar code and the number transfers to the highlighted field.

   The label for this field may be customized to display differently or omitted from displaying at all using the options available in **Sample Defaults**, page **8-6**.

6. Enter the mass of the sample; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.

7. Enter values in the **Skeletal Density** and **Bulk Density** fields that are typical of your sample. These values, like all other values, can be edited in the sample file.

8. Select the appropriate material from the **Material Properties** drop-down list. The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated.

9. If you plan to report statistical process control (SPC) information, enter appropriate information in the **User Parameter** fields. These user-definable parameters enable you to track statistical process control data; refer to **Sample Defaults**, page **8-9** for additional information.

10. Click the **Analysis Conditions** tab. Choose the analysis conditions appropriate for your most commonly analyzed material.

11. Click the **Report Options** tab. Choose the desired reports, using **Edit** to specify details; then click **Save**.

12. Click **Close** to close the dialog.

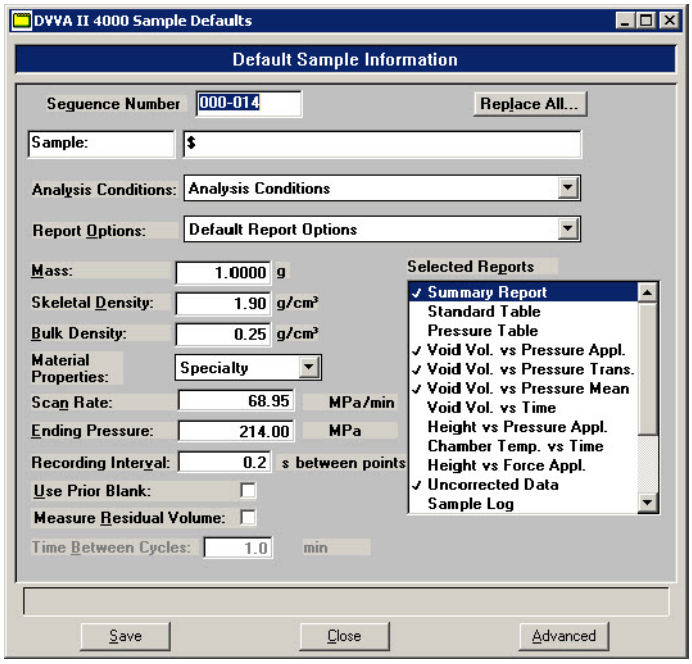
Basic Format

Perform the following steps to define defaults for a sample information file in the Basic format. The defaults you specify in this format also display as the defaults for sample files in the Restricted format.

Refer to **Basic**, page **8-10** for a description of the fields associated with specifying defaults for sample information files in the Basic format.

1. Select **Options > Sample Defaults**; the Basic Default Sample Information dialog is

displayed.



2. In the **Sequence Number** field, specify a default string. This is the number that is incrementally sequenced and displays in the **File name** field when you select **File > Open > Sample Information**. You can use up to eight characters.

3. In the field on the right of the **Sample** line, enter a format for the sample identification. Include the $ symbol if you want the sample file number included in the identification. You can use up to 42 alphanumeric characters.

You also can edit the word *Sample*. For example, you may prefer to use *Material* or *Test*. You can enter up to 15 characters in this field.

4. Select the down arrow to the right of the **Analysis Conditions** and **Report Options** fields to choose previously defined parameter files as your default files.

5. Enter the mass of the sample; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.

6. Enter values in the **Skeletal Density** and **Bulk Density** fields that are typical of your sample. These values, like all other values, can be edited in the sample file.

7. Select the appropriate material from the **Material Properties** drop-down list. The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated.

8. The values and options shown for the **Scan Rate**, **Ending Pressure**, **Recording Interval**, **Use Prior Blank**, **Measure Residual Volume**, and **Time Between Cycles** fields are the ones specified in the Analysis Conditions file you selected as the default.

9. The reports shown selected with a check mark in the **Selected Reports** window are the ones selected in the Report Options file you chose as the default.

10. Click **Save**, then **Close**.

Creating Sample Information Files

A sample information file must be assigned to every sample that is analyzed. When you create a sample file, you can accept the default values or edit them as desired. You can create a sample information file using the Advanced, Basic, or Restricted format.

Advanced Format

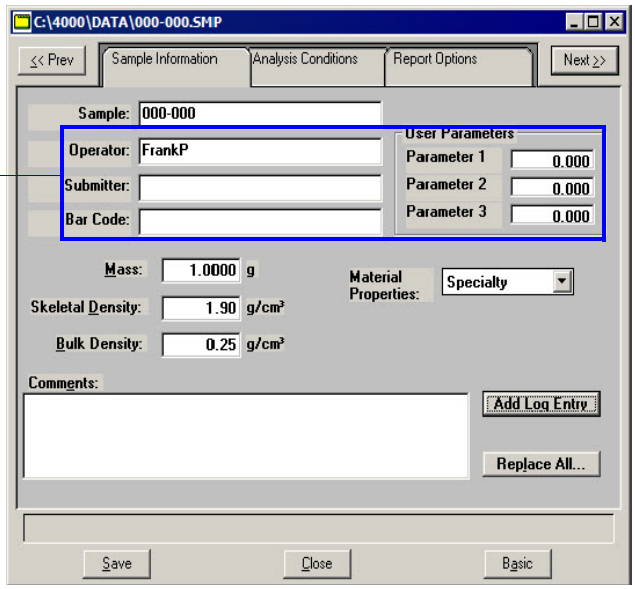
The Advanced format allows you to customize the parameters of a sample information file. Refer to **Advanced**, page **5-5** for a description of the fields associated with creating sample information files in the Advanced format.

1. Select **File** > **Open** > **Sample Information**; the Open Sample Information File dialog is displayed.

2. Accept the next sequenced file number or enter a new name in the **File name** field; you can use up to eight characters.

3. Click **OK**, then **Yes** to create the file; the Sample Information dialog is displayed.

These fields do not display if you individually selected Omit when specifying sample defaults.



The values that appear in the fields are the ones specified in **Sample Defaults**.

4. Accept the default identification in the **Sample** field or change it to an appropriate one. The dialog in Step 3 shows the sample file number because the dollar ($) symbol was used when specifying sample defaults.

If a sample information file already exists containing the values you wish to use in this file, you can click Replace All to copy them into this one. You can still edit the values after they are imported.

5. Edit the **Operator** and/or **Submitter** fields as needed.

6. The **Bar Code** field enables you to enter bar code information. If bar code information is not used, you can use this field to enter additional information about the sample; for example, you may wish to enter the lot number of your sample.

   This field, as well as other fields on the dialog, accepts data from a bar code reader. A bar code reader can be attached to one of the USB connectors on the computer. Simply scan the bar code and the number transfers to the highlighted field.

   The label for this field may be customized to display differently or omitted from displaying at all using the options available in **Sample Defaults**, page **8-6**.

7. Enter the mass of the sample; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.

8. Edit the **Skeletal** and **Bulk** densities if needed.

9. Choose the type of sample material you are analyzing. The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated.

10. Use the **Comments** window to record specifics of the analysis or its conditions. Anything you enter in this window is printed in the report header.

11. Click **Save** to save the information you entered.

12. The steps for completing the remaining parameters of the sample information file are explained in subsequent sections:

    - **Analysis Conditions**, page **3-10**
    - **Report Options**, page **3-11**

    Simply click on the tabs to open its associated dialog.

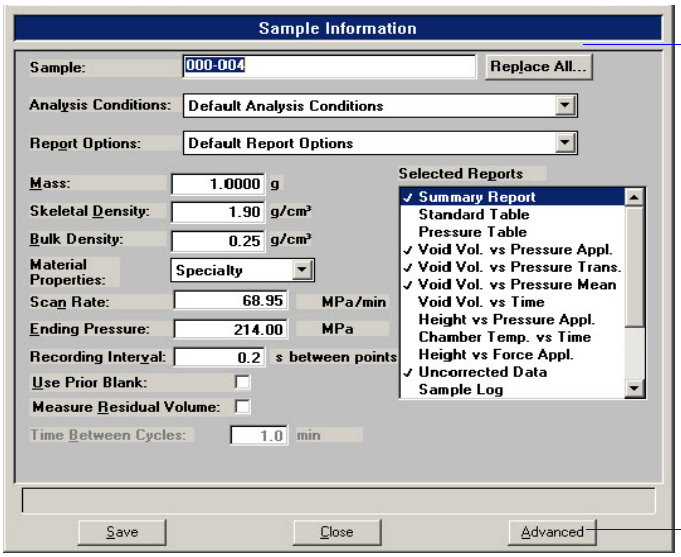
Basic and Restricted Formats

Sample information files are created in the Basic and Restricted formats using predefined parameter files. Refer to **Basic**, page **5-7** for a description of the fields associated with creating sample information files using the Basic or Restricted format.

1. Select **File > Open > Sample Information**; the Open Sample Information File dialog is displayed.

2. Accept the next sequenced file number or enter a new name in the **File name** field; you can use up to eight characters.

3. Click **OK**, then **Yes** to create the file; the Sample Information dialog is displayed.



Use this push button to copy parameters from an existing file into the current one.

Not displayed when using the Restricted format.

The defaults that appear in the fields are the ones specified in sample defaults.

4. Accept the default identification or change it to an appropriate one. The dialog above shows the sample file number because the dollar ($) symbol was used in Sample Defaults.

5. Click the down arrow to the right of the Analysis Conditions file and choose the parameter file you wish to use (or accept the default). The conditions specified in the file display in the **Scan Rate**, **Ending Pressure**, **Recording Interval**, **Use Prior Blank**, **Measure Residual Volume**, and **Time Between Cycles** fields; these values can be edited if desired.

6. Click the down arrow to the right of the **Report Options** field and choose the file you wish to use (or accept the default). The reports selected in the file you choose are shown in the **Selected Reports** window; you change the reports selected if desired.

   You can also switch to the Advanced format and edit details of the reports if you are using the Basic format; you cannot switch to the Advanced format if you are using the Restricted format.

7. Enter the mass of the sample; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.

8. Edit the **Skeletal** and **Bulk** densities if needed.

9. Choose the type of sample material you are analyzing. The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated.

10. Click **Save**, then **Close**.

Creating Parameter Files

The following file types exist as part of the sample information file or as an individual parameter file:

- Analysis conditions, page **3-10**
- Report options, page **3-11**

Having these files exist independently enables you to use them over and over again.

Several predefined parameter files are included with the DVVA II application. Although these files may come close to the needs of your laboratory, you may wish to define additional ones. Or you can use a predefined file as a starting point. This is easily accomplished by creating a new file and then selecting **Replace**. A dialog is displayed so that you can select the existing file containing the values you wish to use.

Be sure to save new parameter files to the directory specified as the Parameter Files Directory (see **Parameter Files Directory**, page **8-20**) to have them display in the drop-down lists. Unless you have edited the parameter files directory, the files are saved to the default PARAM directory automatically.

You can also create parameter files from the Advanced Sample Information dialog. For example, select **File > Save As > Analysis Conditions** to save the analysis conditions of the current sample information file as a standalone Analysis Conditions parameter file.

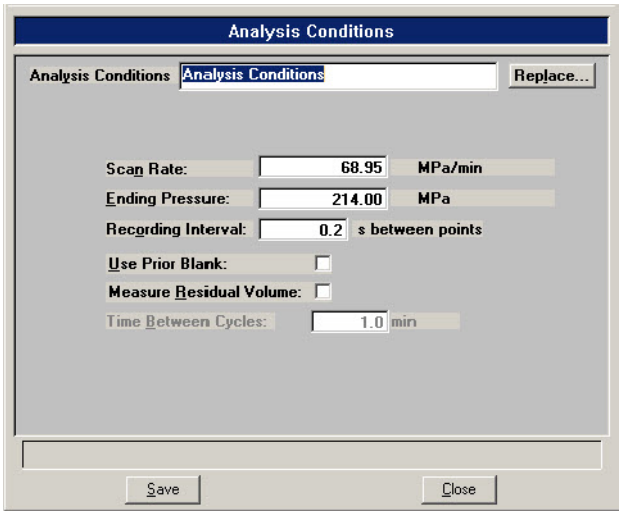
Analysis Conditions

Refer to **Analysis Conditions**, page **5-10** for a detailed description of the fields on this dialog.

1. Select **File > Open > Analysis Conditions**; the Open Analysis Conditions File dialog is displayed.

2. Enter a name (up to eight characters) in the **File name** field, then click **OK**.

3. Click **Yes** to create the file; the Analysis Conditions dialog is displayed.



4. Enter a description (up to 42 characters) in the **Analysis Conditions** field. Use an intuitive description, one that will help you identify the type of sample you plan to analyze using these analysis conditions.

5. In the **Scan Rate** field, enter a a rate at which pressure is to increase during analysis.

6. Enter the pressure at which to end the analysis.

7. Enter a value for the interval between points.

8. Select **Use Prior Blank** to skip the blank analysis performed automatically before each analysis; the blank data from the most recent analysis available will be used.

When using this option, the height of the sample material in the sample chamber must be less than or equal to the height of the carbon for which the blank was collected.

9. Select the **Measure Residual Volume** to have residual volume measured. The **Time Between Cycles** field is enabled, allowing you to enter how long to wait before taking the second measurement.

10. Click **Save**, then **Close**.

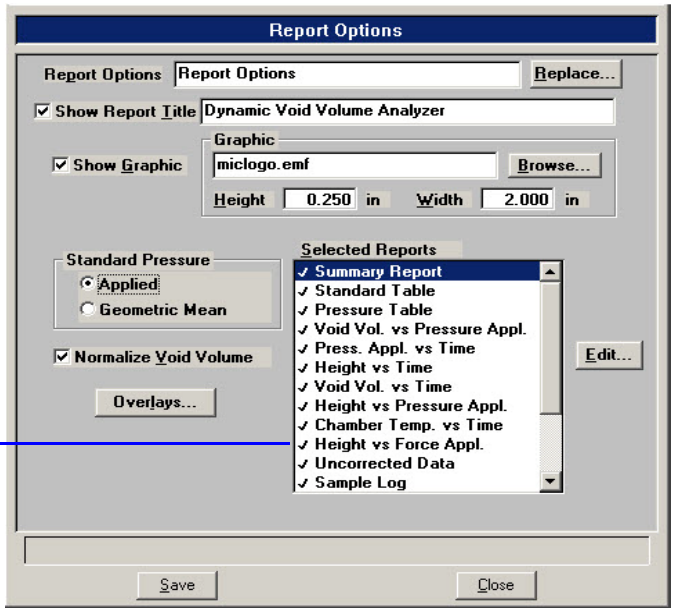
Report Options

Report options specify the types of reports to be generated from an analysis. They also help you customize details of reports such as axis scale, axis range, and column headings.

You can customize report options files to accommodate the requirements of your analyses. For example, you can generate a simple report that lets you determine the basic characteristics of the sample. Then use that report to make choices about the variables you want to include in more lengthy, sophisticated reports. You can generate reports automatically after analysis, or any time during or after an analysis. Reports generated during an analysis only include data collected up to the time of the report.

Refer to **Report Options**, page **5-12** for a detailed description of the fields on this dialog.

1. Select **File** > **Open** > **Report Options**; the Open Report Options File dialog is displayed.
2. Enter a name (up to eight characters) in the **File name** field, then click **OK**.
3. Click **Yes** to create the file; the Report Options dialog is displayed.



A report is selected when it is preceded with a check mark.

4. Enter a description (up to 42 characters) in the **Report Options** field. Enter an identifier that gives a more intuitive description of the file's contents.
5. Select **Show Report Title** and enter the title you wish to appear at the top of the report. Or deselect this option if you prefer not to have a report title.

If your company logo exists as a bitmap (bmp) or enhanced metafile (emf), you can have it display in the report header by selecting *Show Graphic*. Click Browse to select the file; use the *Height* and *Width* fields to specify the size.

6. Choose the type of pressure to be interpolated for the user defined tabular reports, the Summary Report, the Pressure Table Report, and the void volume normalization.

   Applied: the force of the upper piston only.

   Geometric Mean: the calculated geometric mean of the applied (upper piston) and transmitted (lower piston) forces.

7. Click **Normalize Void Volume** to have the void volume data normalized to a reference model.

8. If you wish to compare the same type of graph from multiple files, click **Overlays** and choose the files. Be sure to edit the graph from the **Selected Reports** window and choose **Samples** from the **Overlay** drop-down list. (Refer to **Generating Graph Overlays**, page **3-27** for additional information on overlays.)

9. Double-click on the report to select it (a check mark indicates selection). Reports are deselected in the same manner.

   You can edit some reports by highlighting and selecting the desired report; then click **Edit** (refer to **Report Options**, page **5-12**).

10. Click **Save**, then **Close**

Preparing the Sample

Prepare your sample but do not load it into the sample chamber until prompted. If you plan to:

- use blank data from the last analysis, you will be prompted when you click **Start** on the Sample analysis dialog.
- have the automatic blank analysis performed, you will be prompted when the blank analysis is completed.

1. Preheat a drying oven to 125 ºC. Place enough carbon black in the container to run your sample (1 gram per analysis is recommended), plus additional carbon black in case mass is decreased during the drying process.
2. Place the container in the oven and bake for at least one hour.
3. When the carbon black is dry, remove the container from the oven and immediately cap the container. Allow the sample to cool to room temperature.

4. Place a clean scale pan on the balance; tare the balance.
5. Using a spatula, add your prepared, degassed sample to the scale pan until the balance displays 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram).

6. When you start the analysis, you will be prompted by the software to load the sample. At that time, remove the pan from the balance and load the sample following the directions given in **Performing an Analysis**.

Performing an Analysis

A blank analysis is always performed prior to the analysis, unless you select the **Use Prior Blank** option. Do not place the prepared sample into the sample chamber until prompted to do so.

Use of certain USB devices or the addition or removal of a USB device during an analysis may cause a delay in data acquisition, resulting in a loss of data or the cancellation of an analysis. Avoid the use of attached USB devices such as flash drives, digital audio players, or cellular phones during an analysis. Additionally avoid adding or removing USB devices during an analysis.

1. Wipe the upper and lower piston tips with a paper towel or Kimwipe®.

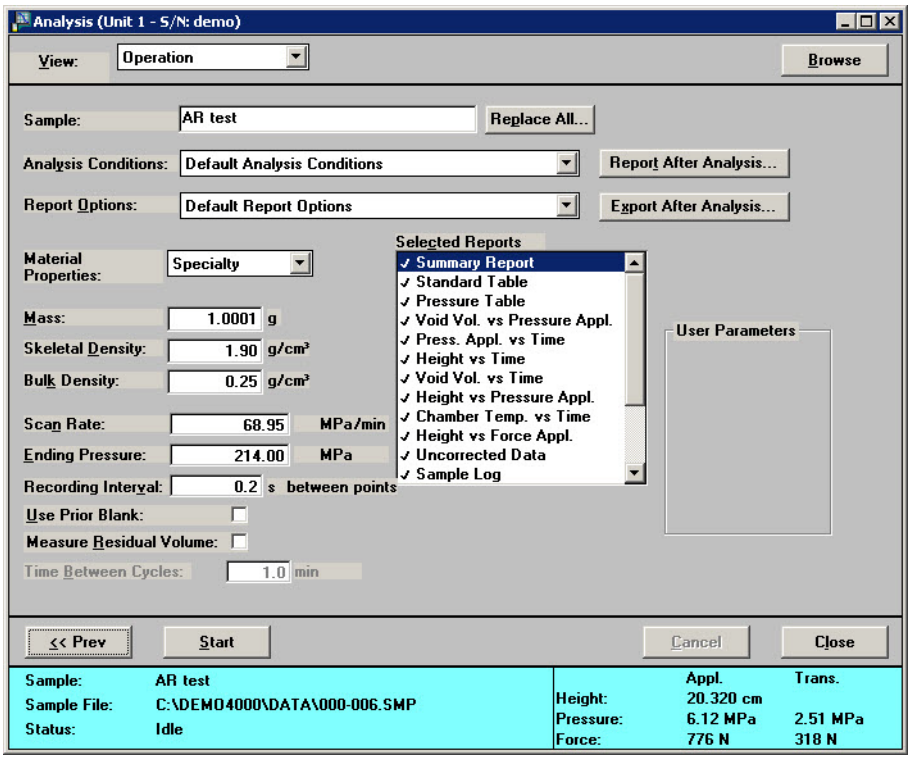
2. Insert the sample tray.

3. Close the safety shield, then press the **Reset** button. The analyzer will not operate if the safety shield is not completely closed.

4. Select **Unit > Sample Analysis**; the Analysis dialog is displayed with the Open Sample Information File dialog positioned on top.

5. Choose a file for your analysis and click **OK**; the Analysis dialog containing the parameters of the selected file is displayed.

You can also accept the next sequenced number and create a new file if desired. Use the Replace All push button to replace file parameters, or the parameter files drop-down lists.



6. Enter the sample weight in the **Mass** field and verify values for other parameters.

7. Click **Report After Analysis** and choose report output options to generate reports automatically after the analysis.

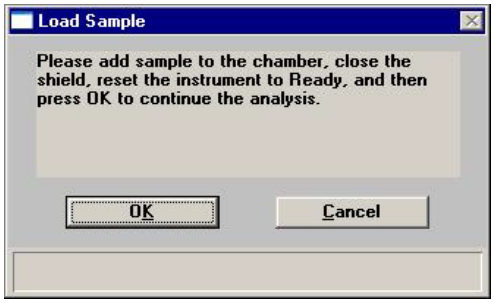
8. Click **Export After Analysis** and choose export options to export report data automatically after the analysis.

9. Click **Start.**

   - If a blank analysis is to be run, the analysis proceeds. When the analysis is complete, the dialog shown in step 10 displays.

   - If a blank analysis is not to be run, go to step 10.

10. A dialog prompting you to load the sample is displayed.



DO NOT click **OK** before completing the tasks in the dialog.

a. Open the safety shield and pour the prepared sample into the sample chamber; tap the pan to empty as much as possible.

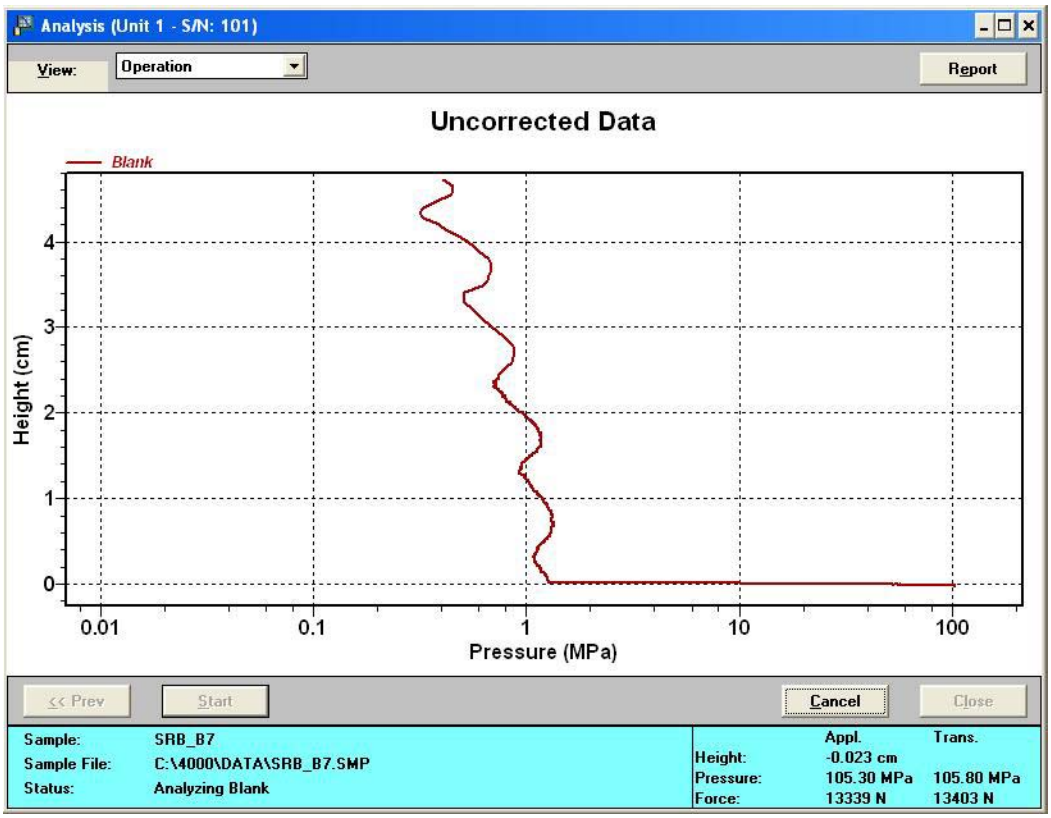
b. Brush out the pan of any remaining sample, then brush around the funnel-shaped sample chamber.

c. Wipe the brush with a Kimwipe (or other lint-free cloth) to remove sample residue.

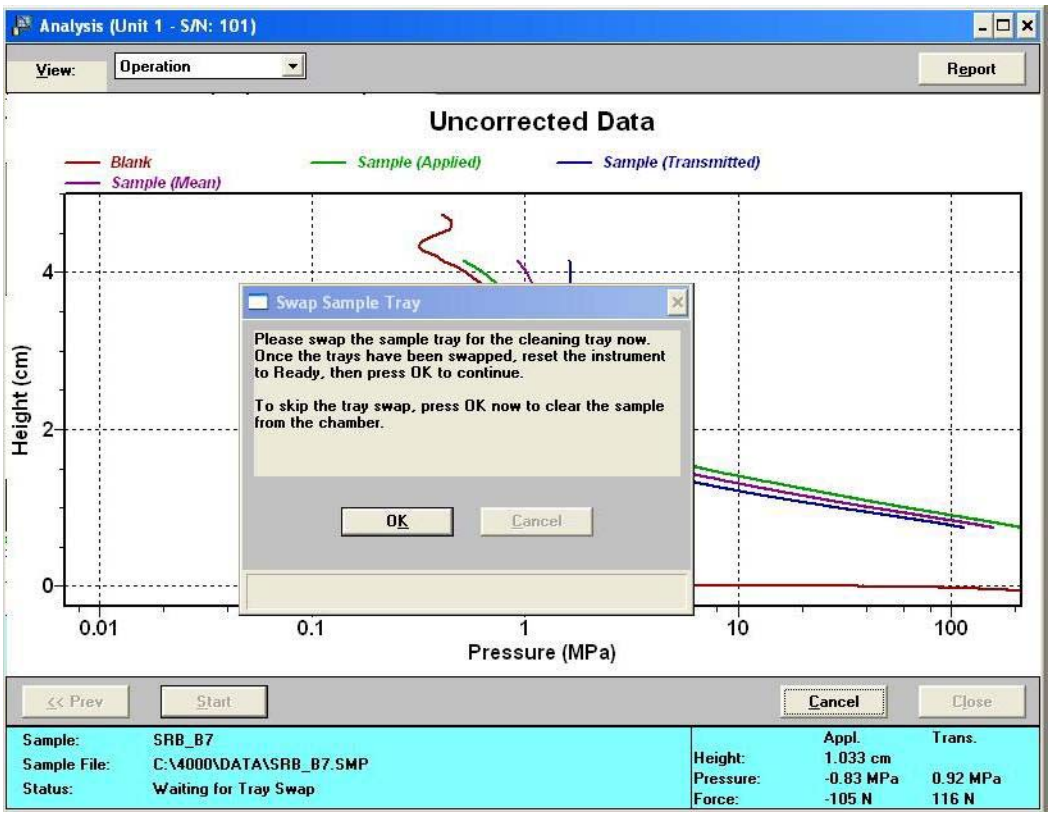
d. Wipe the piston tip with a paper towel or Kimwipe.

e. Slide the safety shield down completely, then press the **Reset** button.

11. Click **OK** on the Load Sample dialog to begin analysis on the sample; the analyzing view of the Analysis dialog is displayed.



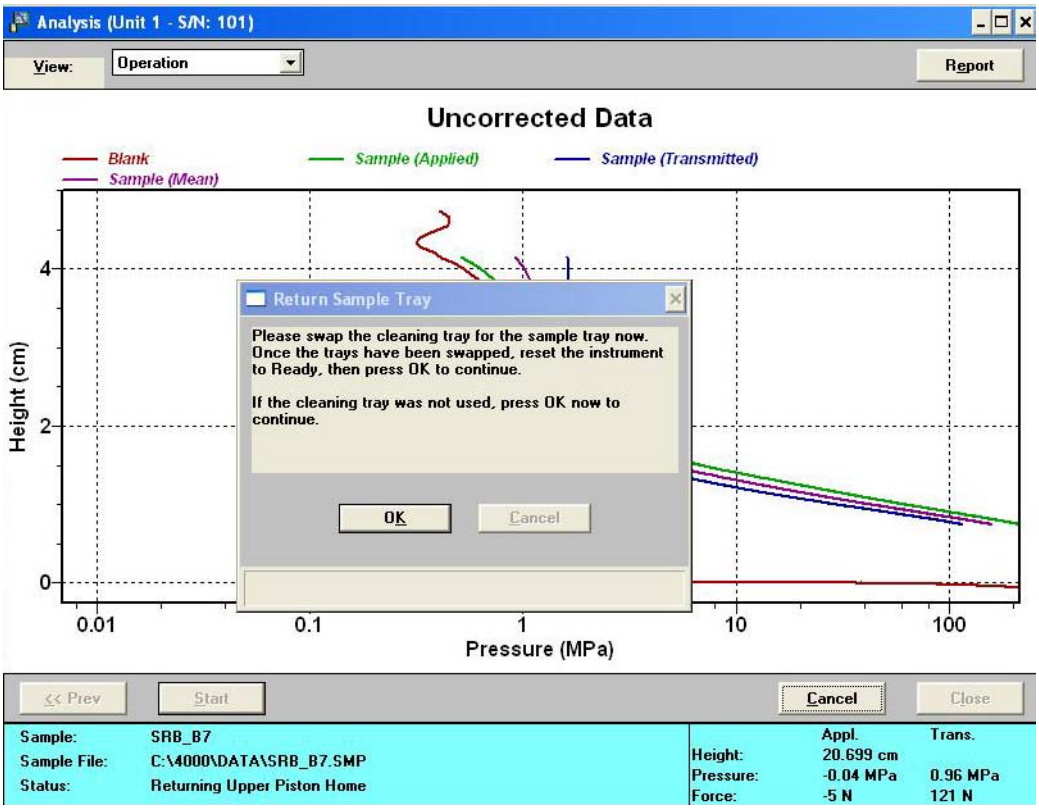
12. When the analysis is finished, the following dialog is displayed:



a. Open the tray drawer.

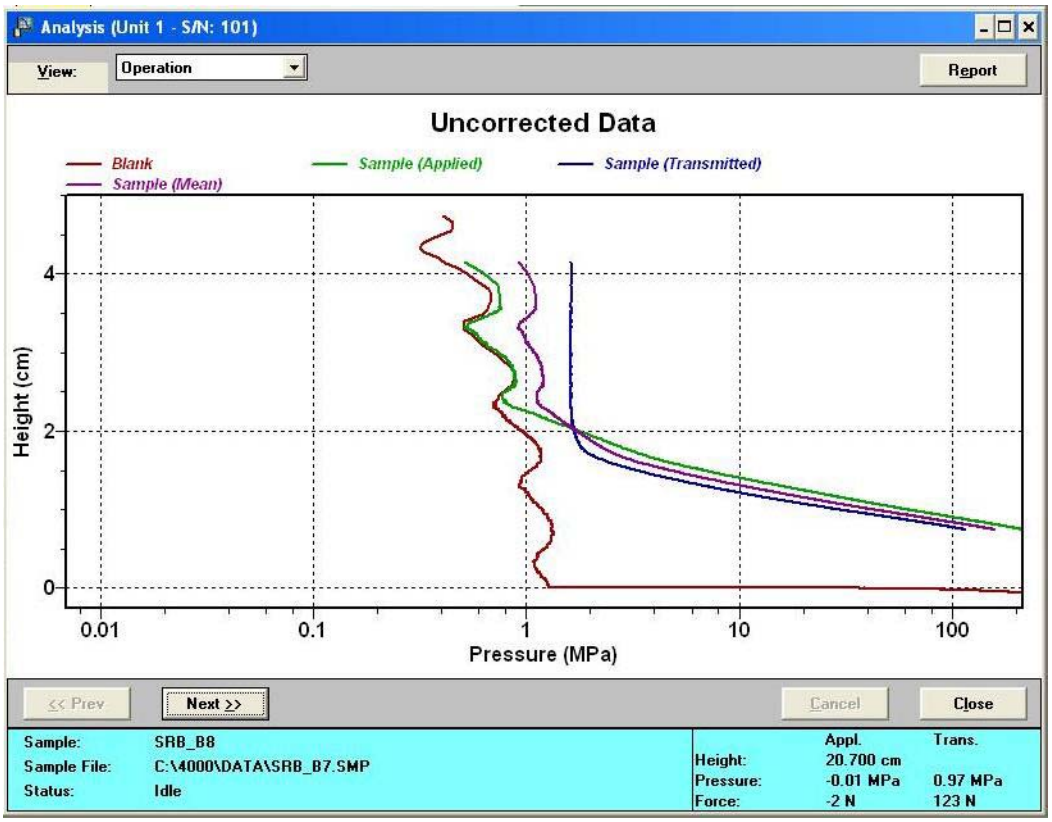
b. Remove the lower piston tray, insert the waste tray to collect the sample, and close the drawer, click **OK**, then press the **Reset** button.

c. After the sample has ejected, a dialog prompting you to remove the waste tray and replace the lower piston tray is displayed.



d. Do as instructed, click **OK**, then press the **Reset** button. Be sure to clean the lower piston tip before inserting back into the drawer.

13. When the analysis is finished, a screen similar to the following is displayed.



Click:

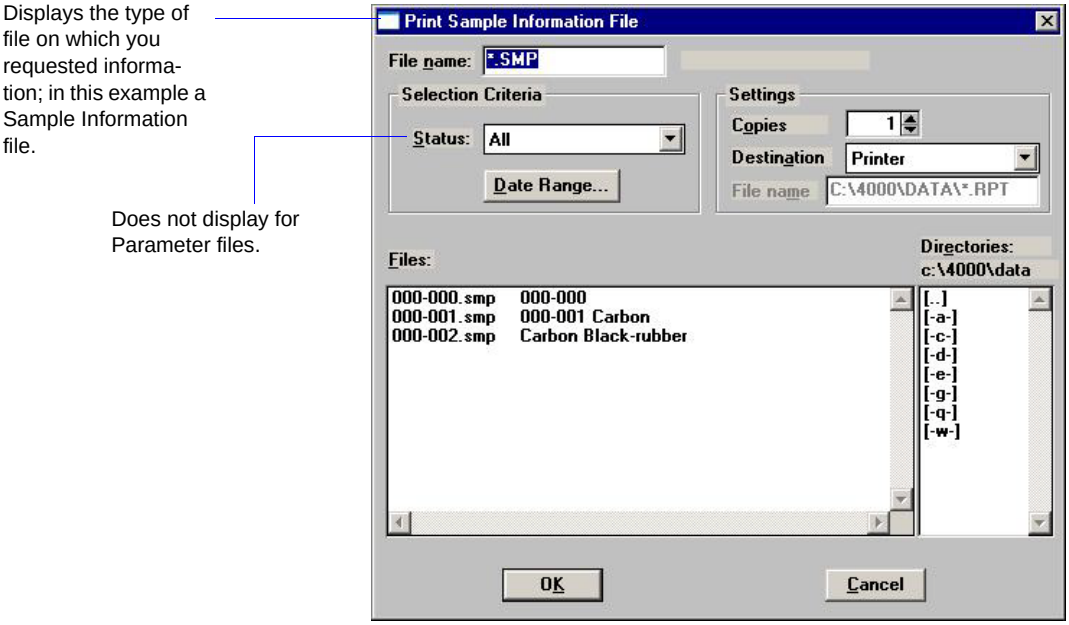
- **Report** to view the results.
- **Next** to perform another analysis; then click **Browse** to choose the next sample file.
- **Close** to close the dialog.

Printing File Contents

Print enables you to print the contents of one or more sample or parameter files to the screen, a printer, or a file. The print dialog is common to all file types.

Perform the following steps to print the contents of a sample or parameter file:

1. Select **File > Print > (File type)**; a dialog similar to the one shown below is displayed.

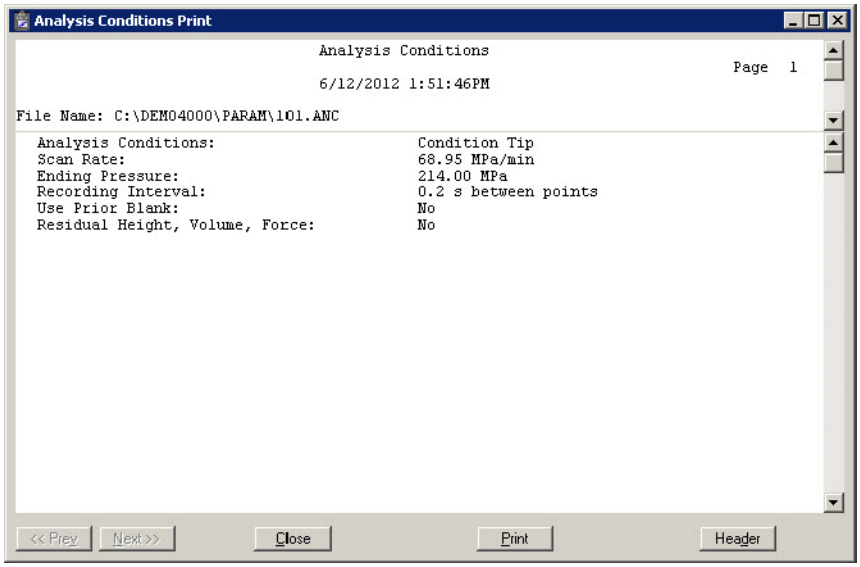


2. From the **Files** list window, choose the desired file(s). You can choose multiple files, by holding down **Ctrl** while making your selections.

3. At the **Destination** field, click on the down arrow and choose a destination for the list output.

   - **File**: enter a name in the **File name** field, or accept the default name.
   - **Printer**: enables the **Copies** field allowing you to print up to four copies to a printer.
   - **Screen**: prints to the computer screen

4. Click **OK**, file contents are sent to the selected destination; this example shows an Analysis Conditions file printed to the **Screen**.



Close: closes the dialog

Print: prints the report to the default printer

Header: toggles the header on and off

Prev and **Next**: enabled when the report contains multiple pages allowing you to advance to other pages

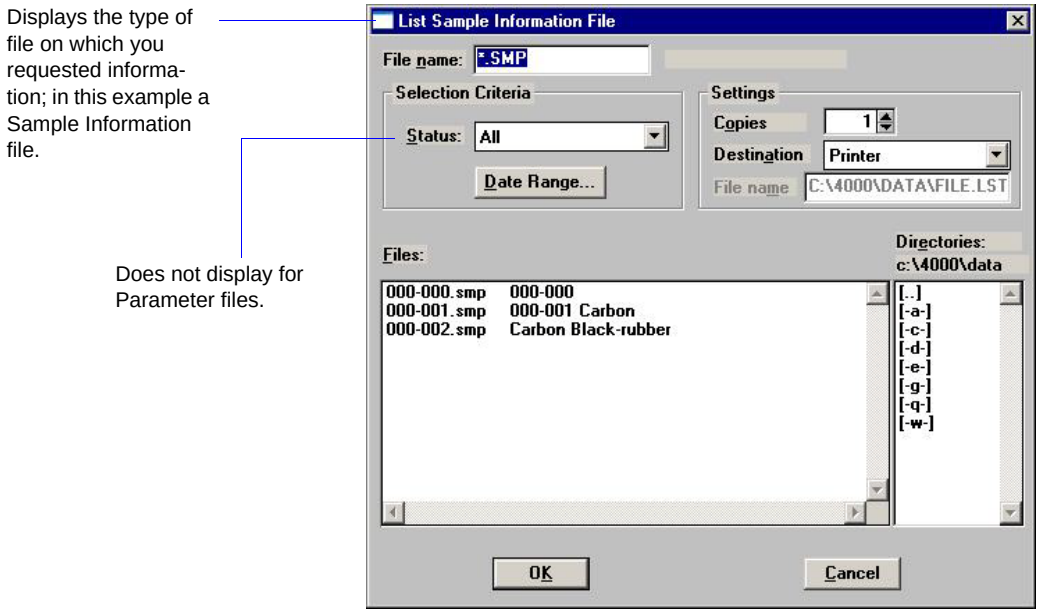
Listing File Statistics

List enables you to generate a list of the following information on one or more sample or parameter files:

- File name
- Date the file was created (or last edited)
- Time the file was created (or last edited)
- File identification
- File status

The List dialog is common to all file types. Perform the following steps to generate a list of file statistics:

1. Select **File > List > (File type)**; a dialog similar to the one shown below is displayed.

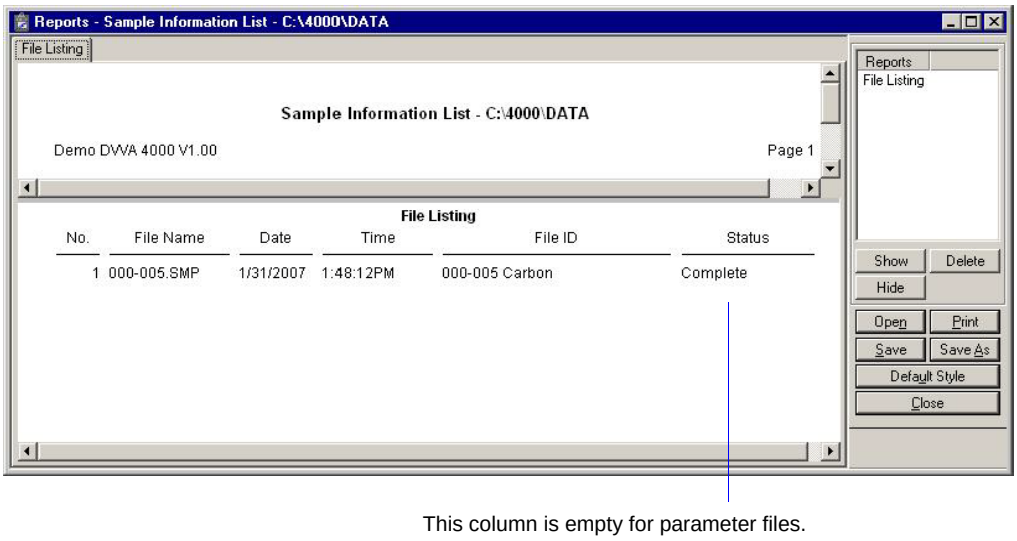


2. From the **Files** list window, choose the desired file(s). If you wish to include all files in the list, leave all files deselected.

3. At the **Destination** field, click on the down arrow and choose a destination for the output.

   - **File**: enter a name in the **File name** field, or accept the default name.
   - **Printer**: enables the **Copies** field allowing you to print up to four copies to a printer.
   - **Screen**: prints to the computer screen

4. Click **OK**, a list for the requested file(s) is sent to the selected destination; this example shows a sample file sent to the **Screen**.



Refer to **Tool Bar**, page **7-17** for an explanation of the buttons on the tool bar.

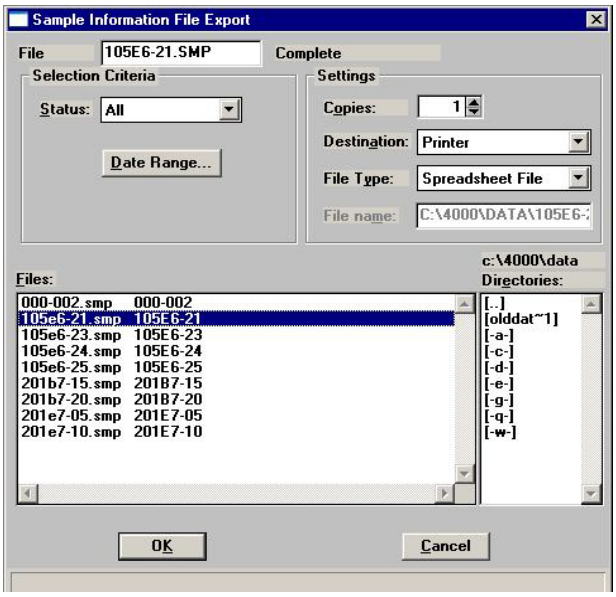
Exporting Data

The **Export** option on the File menu allows you to copy the data in the sample information file and reformat it in ASCII text.

The output file consists of data from the corrected data, blank analysis, and sample analysis.

- Corrected data has four columns: Corrected Height, Corrected Applied Pressure, Corrected Transmitted Pressure, and Corrected Void Volume.
- Data for the blank analysis and the sample analysis are generated in eight columns: Elapsed Time, Height, Applied Force, Transmitted Force, Applied Pressure, Transmitted Pressure, Chamber Temperature, and Ambient Temperature.

1. Select **File > Export**; the Export Sample File dialog is displayed.



2. From the **Files** list window, select the file(s) you wish to export. To choose multiple files, hold down **Ctrl** while making your selections.
3. Choose an output destination.
   - **File**: enter a name in the **File name** field, or accept the default name. If you have selected multiple files, each file is exported as its file name with the appropriate **File Type** extension.
   - **Printer**: enables the **Copies** field allowing you to print up to four copies to a printer.
   - **Screen**: prints to the computer screen.
4. From the **File Type** list, choose whether you wish to export the data as a text file, or in a spreadsheet format.
5. Click **OK** to export the file(s) to the specified destination.

Generating Graph Overlays

Use graph overlays when you wish to compare graphically results for multiple samples or multiple graphs for one sample.

Graph overlays can be implemented in two ways:

- **Multiple-Sample Overlays**
  Overlay results for up to eight samples on top of a previously selected sample.

- **Multiple-Graph Overlays**
  Overlay two different types of graphs from one sample.

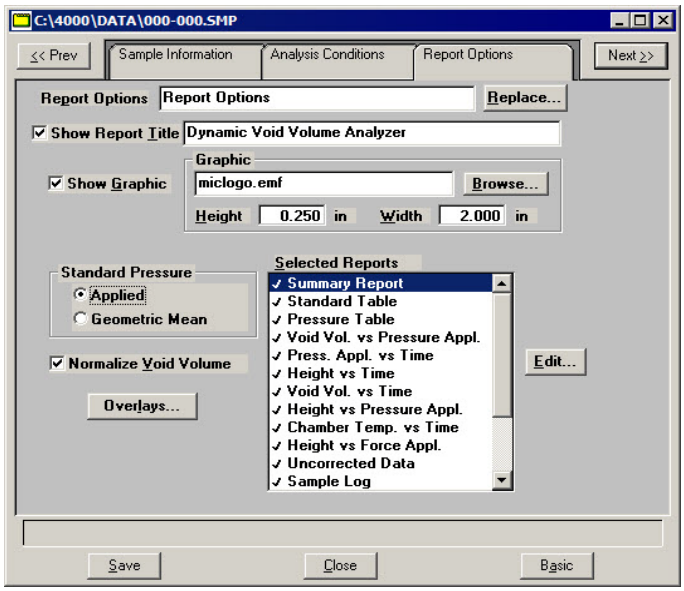
You must use the Advanced format to specify graph overlays.

Multiple-Samples Overlay

This type of overlay enables you to choose up to eight sample files from which to overlay data of the same type as the currently selected one.

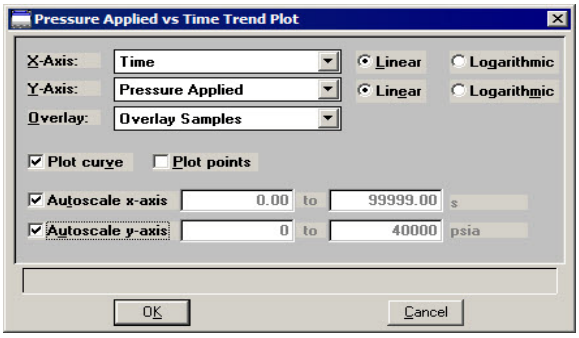
1. Open the desired file. If your dialog is in the Basic format, click **Advanced** to switch to the Advanced format.

2. Click the Report Options tab to display the Report Options dialog.



3. Select reports as desired.

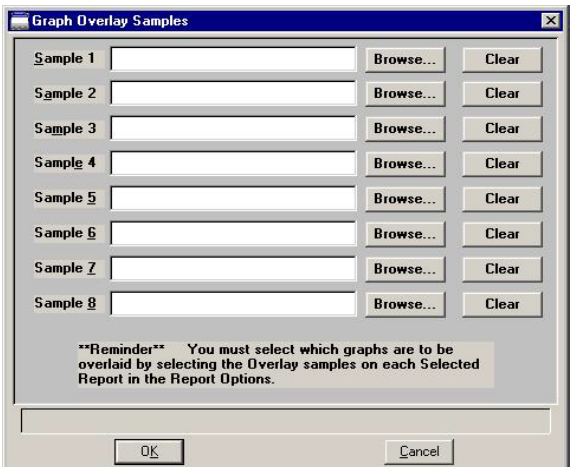
4. Choose the type of graph you wish to overlay, then click **Edit** (this example shows Pressure Applied vs. Time).



5. Click the down arrow to the right of the **Overlay** field and choose **Overlay Samples**.

6. Select any other desired options on the dialog, then click **OK** to return to the Report Options dialog.

7. Click **Overlays**; the Graph Overlay Samples dialog is displayed.



Use the Clear push button to clear the field of its entry.

8. Click **Browse** to the right of the **Sample 1** field; the Plot Overlay Sample Selection dialog is displayed.

9. Choose a sample file, then click **OK**. You may choose up to eight files in this manner.

10. After selecting the desired number of sample files, click **OK** to return to the Report Options dialog.

11. Click **Save** to save your selections, but saving them is not necessary to view overlay results.

12. Select **Reports > Start Report**. The Start Report screen is displayed with the name of your primary file in the **File name** field.

13. Choose the output destination, then click **OK**; the Select Reports dialog is displayed.

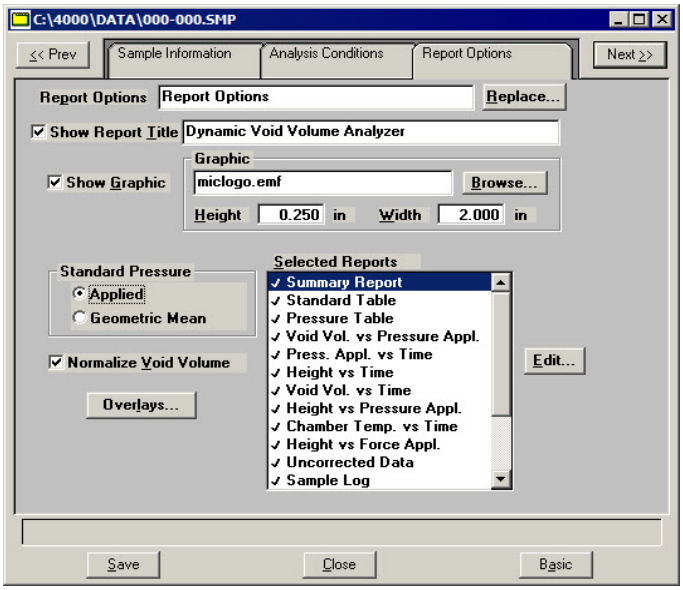
14. Ensure that the desired graph is selected (preceded with a check mark), then click **OK**.

Multiple-Graphs Overlay

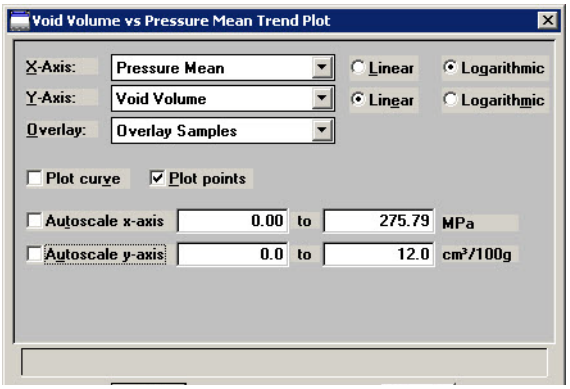
This type of overlay enables you to overlay two graphs in the same file.

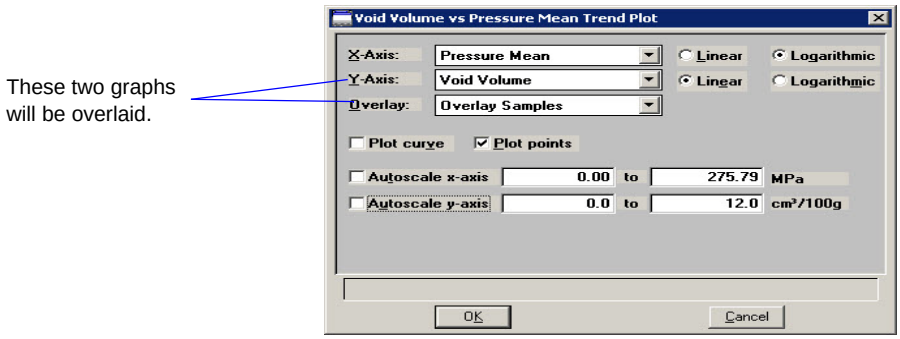
1. Open the file containing the data you wish to use in the overlay. If your dialog is in the Basic format, click **Advanced** to switch to the Advanced format.

2. Click the Report Options tab to display the Report Options dialog.



3. From the **Selected Reports** list, select the graph you wish to use in the overlays, then click **Edit**. A Report Options dialog for that report (or graph) is displayed.





4. Click the down arrow at the **Overlay** field and select a graph type from the list. This selection will be overlaid on the graph selected in the **Y-Axis** field.

5. Click **OK** to return to the Report Options dialog.

6. Click **Save** to save your selections, but saving them is not necessary to view overlay results.

   You must click **Save** if you are specifying overlay options on a file that has not been used in an analysis. For example, you may be creating a Report Options file containing overlay options that you can load into a sample file as needed.

7. Select **Reports > Start Report**; the Start Report screen is displayed with the name of your primary file in the **File name** field.

8. Choose the output destination, then click **OK**; the Select Reports dialog is displayed.

9. Ensure that the desired graph is selected (preceded with a check mark), then click **OK**.

4. SOFTWARE AND SETUP MODIFICATION

This chapter describes how to:

- install the software
- use the Setup program for other functions, page **4-10**

Installing the Software

The DVVA II program can also be installed on a computer other than the one controlling the analyzer. This allows you to:

- create or edit sample and parameter files
- generate reports on completed sample files

Review the Micromeritics PROGRAM License Agreement for restrictions on the use of another copy of the DVVA II program.

Do not attach the USB cable between the computer and the instrument until the software has been installed and the computer restarted.

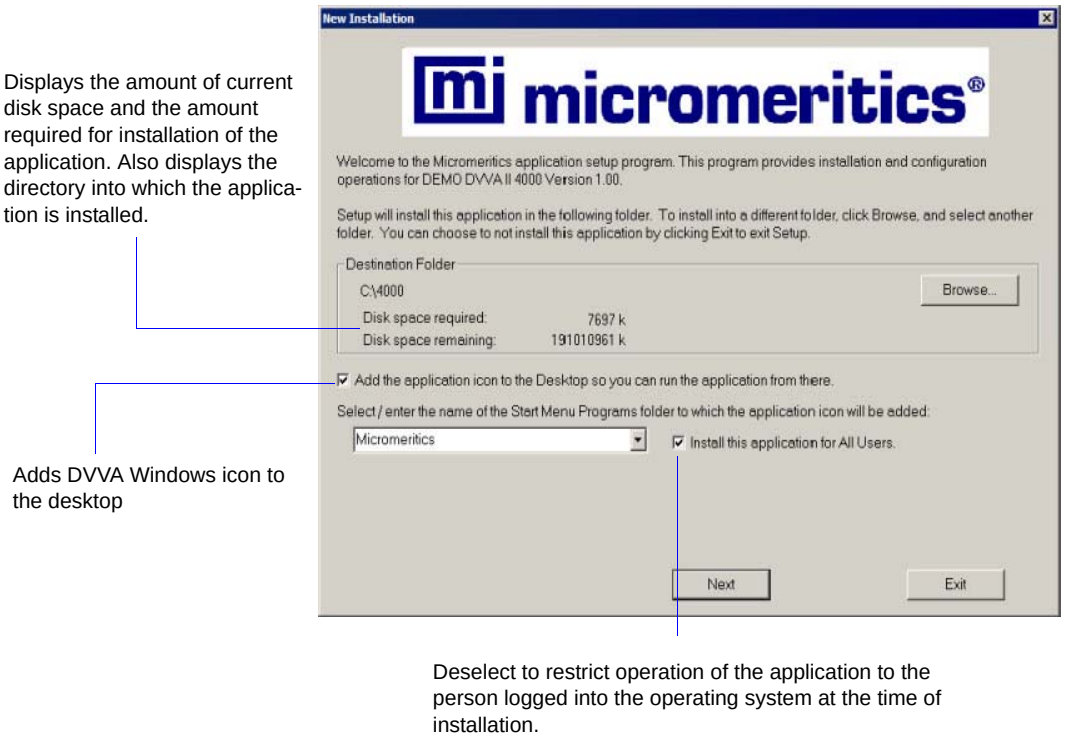
1. Insert the software installation CD into the CD-ROM drive of your computer.

Proceed to Step 4 if AutoPlay is enabled on your computer; Setup will start automatically and display the New Installation dialog.

2. Select **Start** from the **Status** bar, then **Run** from the **Start** menu.
3. Enter the drive designator for the CD-ROM drive, followed by setup. For example:

   e:setup

   Alternatively, you can click **Browse**, navigate to the CD-ROM drive, and select setup.exe.
4. Click **OK**; the New Installation dialog is displayed.



The **Destination Folder** group box displays the amount of current disk space, the amount of disk space required for the analysis program, and the directory into which the application will be installed. If you wish to install the application into a different directory, click **Browse** to choose the directory.

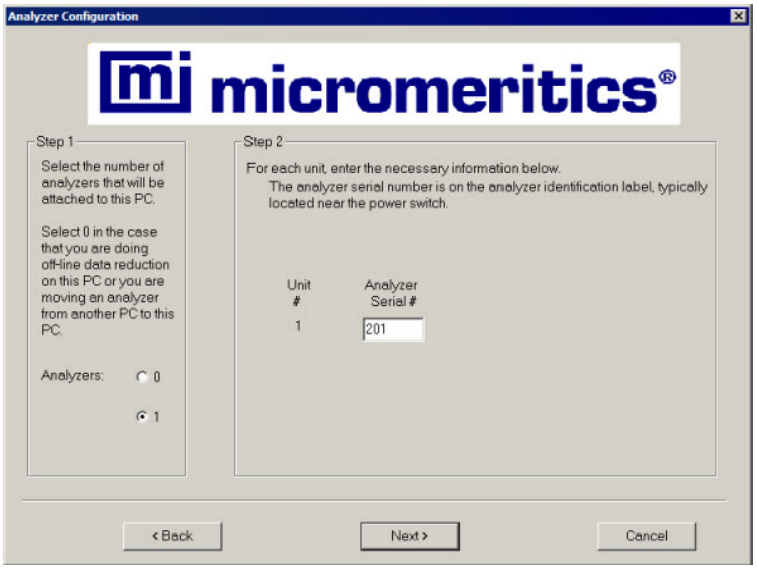
5. Select the check box just below the **Destination Folder** group box to add an icon to your desktop; this enables quick access to the analysis program.

6. The application icon is added to the Micromeritics folder by default. If you prefer a different folder, enter or select one from the drop-down list.

7. The **Install this application for All Users** check box enables you to allow or prohibit users other than the installer to access the application.

   - Select the check box to allow access for all users logged onto Windows.
   - Deselect the check box to allow access for only the user installing the application.

8. Click **Next**; the Analyzer Configuration dialog is displayed.



9. In the Step 1 group box, ensure that 1 is selected.

Choose 0 (zero) if you are installing this program for data reduction on a computer other than the one controlling the analyzer.

10. In the Step 2 group box, enter the serial number (located on the rear panel of the analyzer).

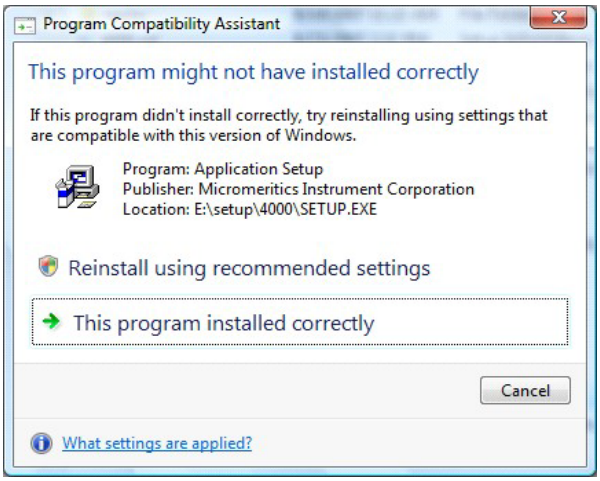
11. Click **Next**; the Calibration File Installation dialog is displayed. Read the information displayed on the dialog and proceed accordingly.

If you select 0 as the number of instruments, the calibration dialog does not display.

12. The Installation Complete dialog containing the **Readme** file will display when installation is complete. This dialog may also contain other important notices. After reading the information contained in this dialog, click **Finish**; for:

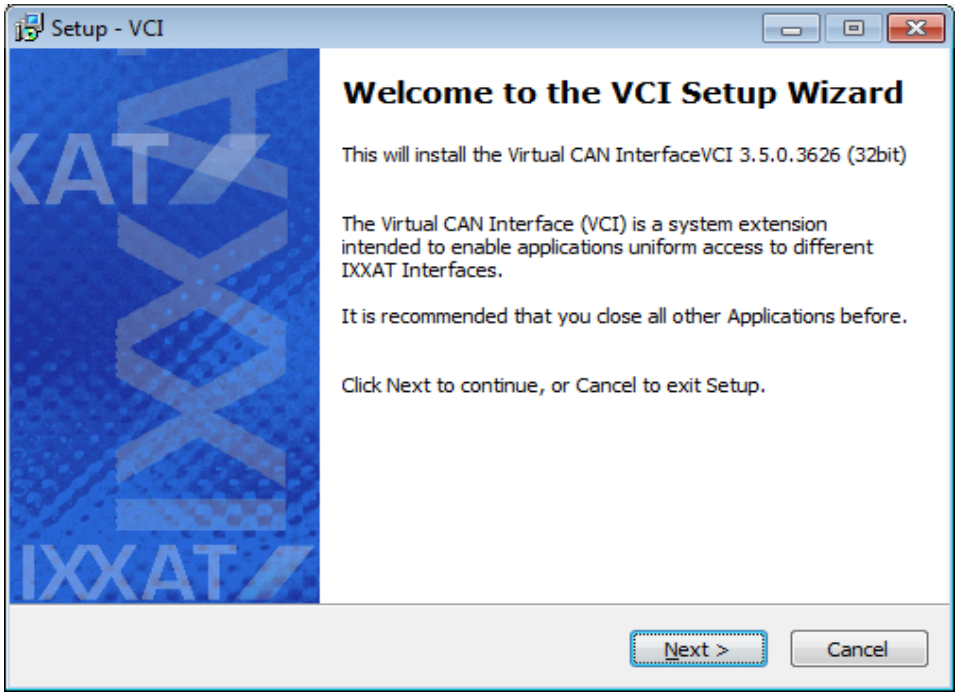
Windows XP operating system	A screen containing the Micromeritics logo is displayed for a brief period and then closes.
Windows 7 and **Windows Vista** operating systems	The following dialogs may display, depending on the security settings on your computer.

Click the **Install this driver software anyway** option; the screen containing the Micromeritics logo closes. After a brief period, this dialog is displayed:



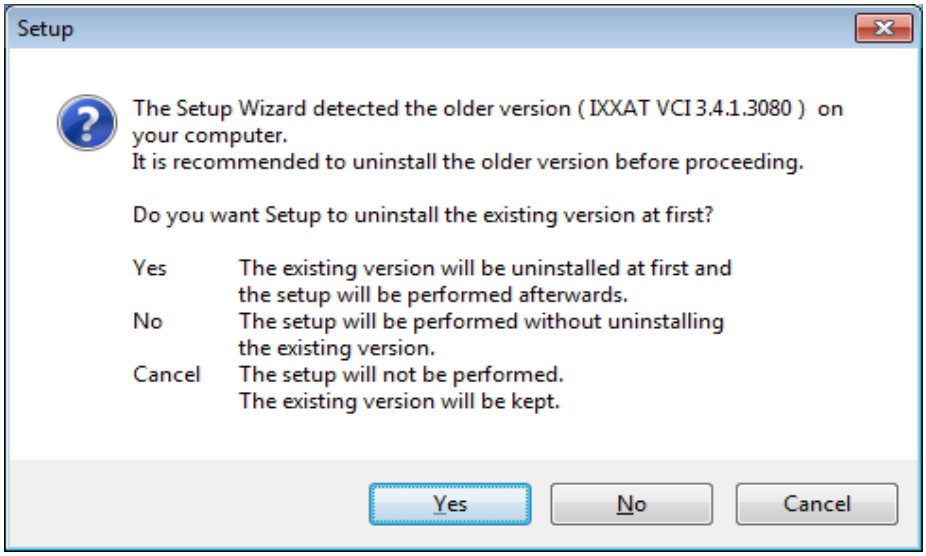
Click **This program installed correctly** to close the dialog.

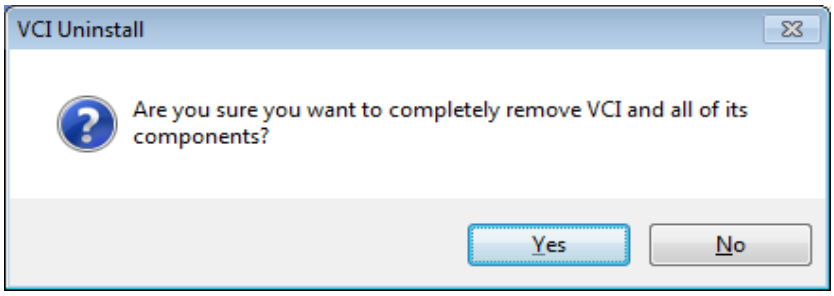
13. The CAN driver Setup Wizard is displayed.



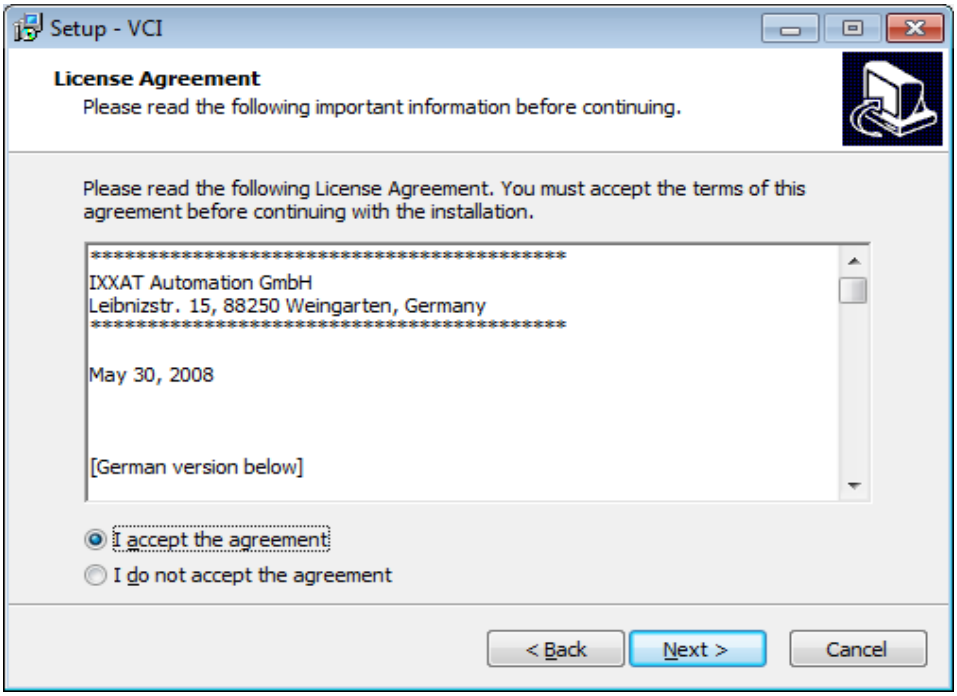
14. Click **Next**.

15. If the CAN driver Setup Wizard indicates that an older version of the software was detected, click **Yes** on the following dialogs to uninstall the older CAN driver version. Otherwise, skip to step 16.



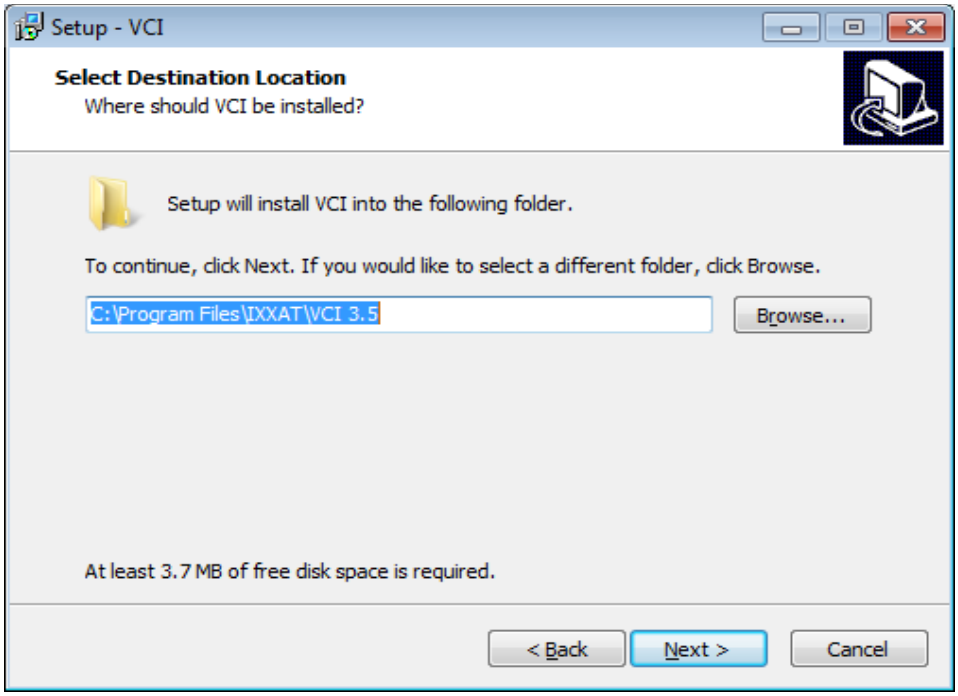


16. The License Agreement window is displayed.



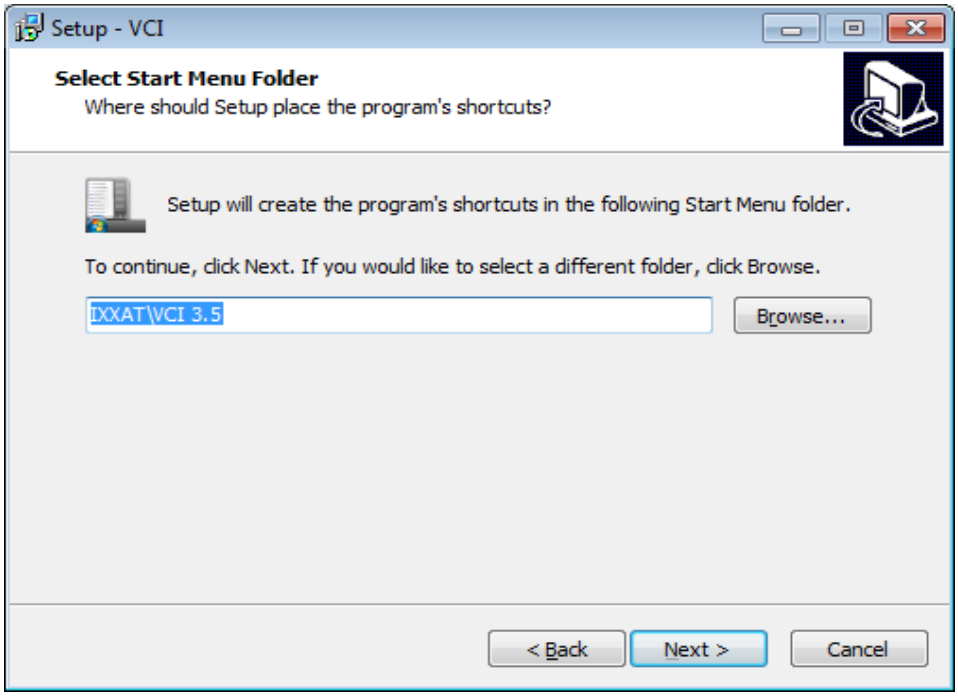
Read the License Agreement for the CAN drivers, select **I accept the agreement**, then click **Next**.

17. The Select Destination Location window is displayed. This window enables you to select the folder in which the drivers program will be installed.



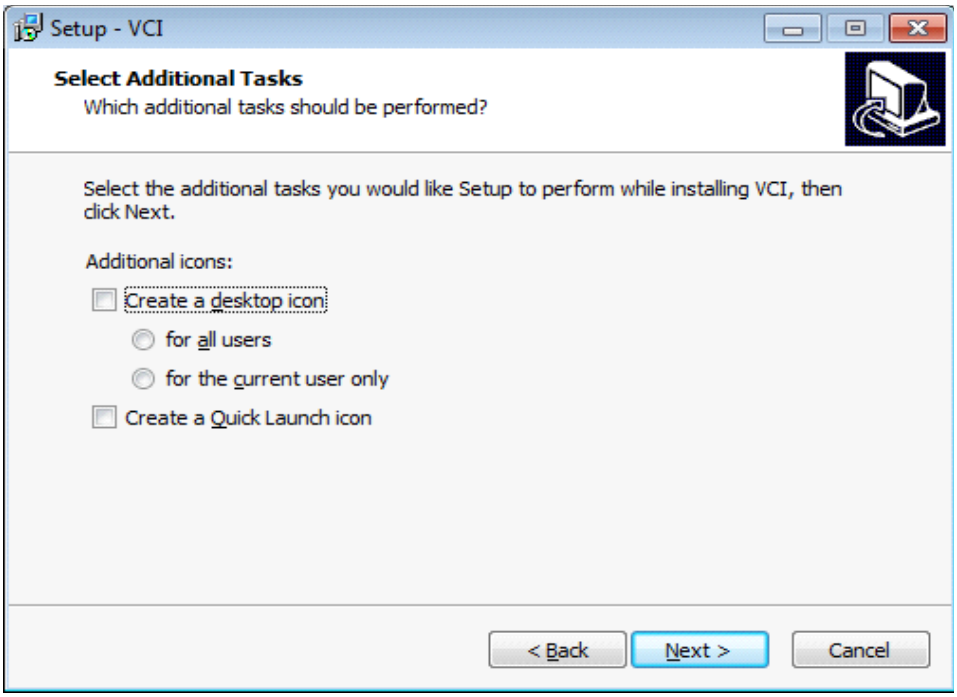
Click **Browse** to choose another folder or click **Next** to use the default folder.

18. The Select Start Menu Folder window is displayed. This window enables you select the folder in which the program shortcuts will be installed.



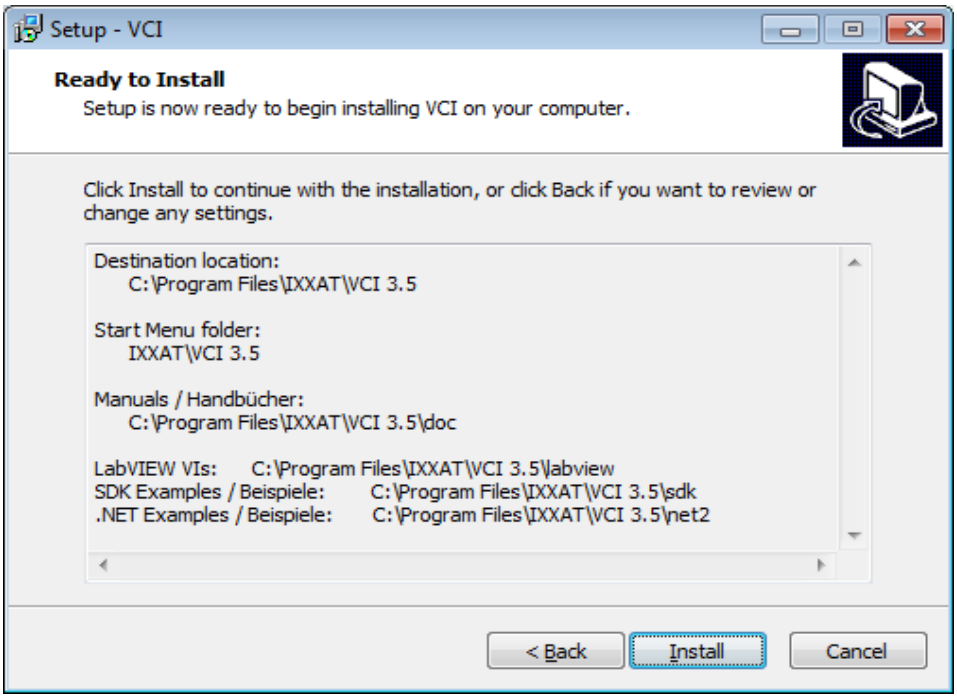
Click **Browse** to choose another folder or click **Next** to use the default folder.

19. The Select Additional Tasks window is displayed.



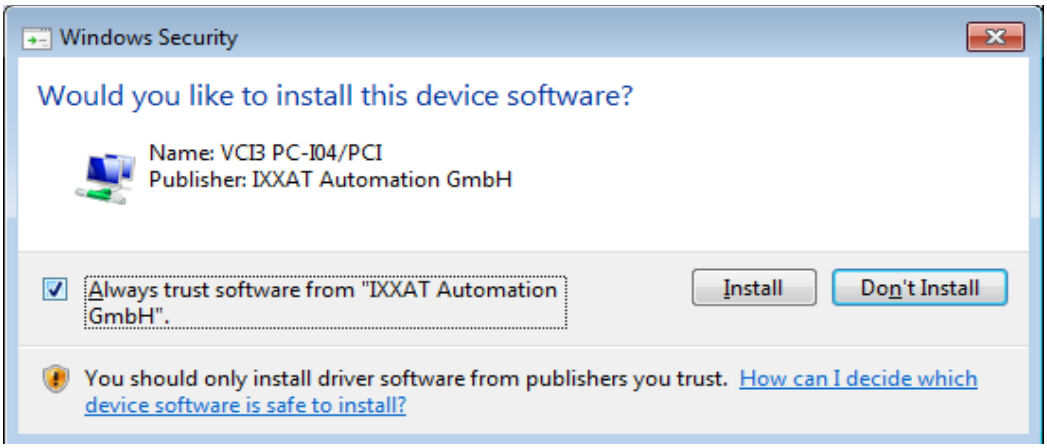
Select the icons to be created, then click **Next.**

20. The Ready to Install window is displayed.



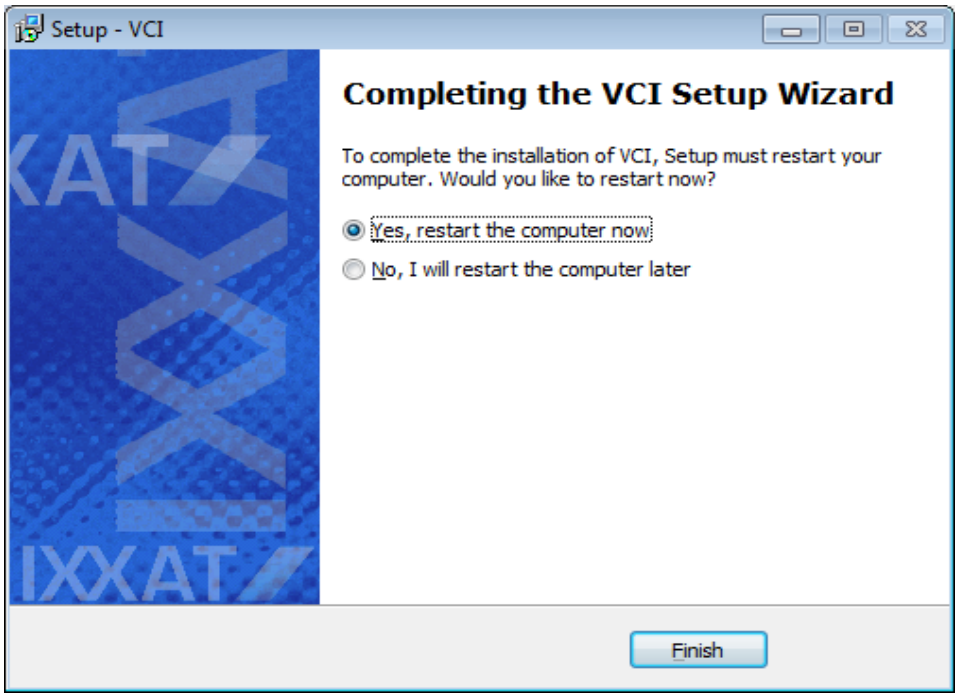
Click **Install**.

21. The Windows Security window is displayed.



Select **Always trust software from "IXXAT Automation GmbH"**, then click **Install**.

22. The Completing the VCI Setup Wizard window is displayed.



23. Click **Yes, restart the computer now**, then click **Finish**.

24. After installation and instrument verification are complete, remove the program CD and store in a secure location. The original program CD contains the calibration files specific to your instrument. Upgrade CDs do not contain calibration files. Therefore, it is important that you maintain your original program CD in a secure location in the event calibration files need to be reinstalled.

Using the Setup Program for Other Functions

After initial installation of the DVVA II 4000 program, the application setup program can be used to:

- Upgrade software, page **4-12**
- Add an Analyzer, page **4-13**
- Move an analyzer from one computer to another computer, page **4-14**
- Remove an analyzer from the computer, page **4-17**
- Reinstall calibration files, page **4-18**
- Uninstall the analysis program, page **4-19**

Change Analyzer Setup and Reset Security to Default menu items are not applicable for the DVAAII 4000.

To start the application setup program:

1. Ensure that the analysis program is not operating and the analyzer is idle.

2. Insert the CD-ROM into your CD-ROM drive.

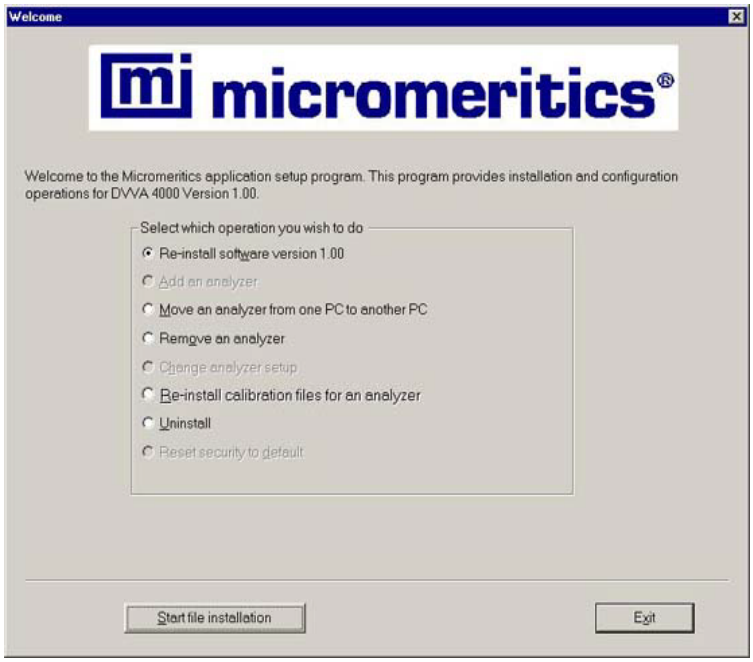
Proceed to Step 5 if AutoPlay is enabled on your computer; Setup will start automatically and display the New Installation dialog.

3. Select **Start** from the Status bar, then **Run** from the Start menu.

4. Enter the drive designator of the CD-ROM drive, followed by **setup**. For example: **e:setup**.

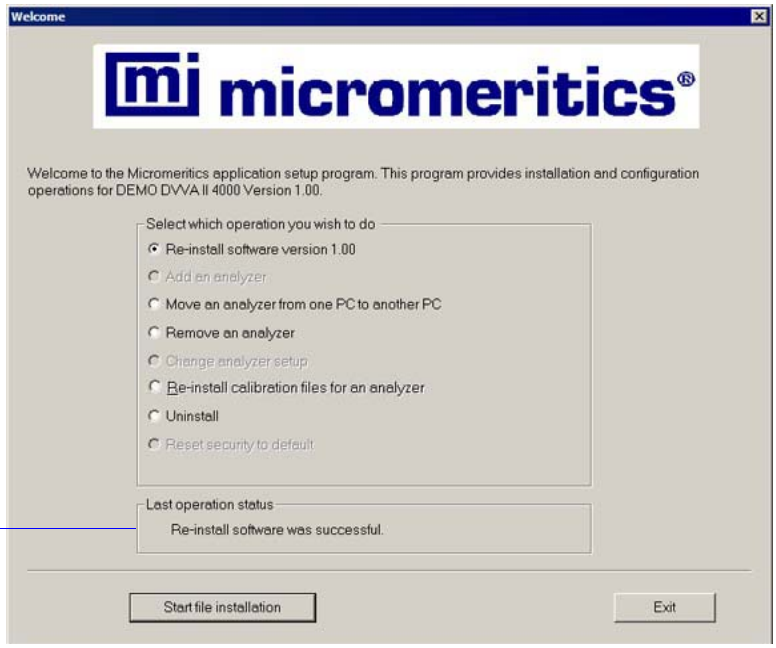
   Alternatively, you can click **Browse**, navigate to your CD-ROM drive, and select **setup.exe**.

5. Click **OK**; the setup Welcome screen showing the options available is displayed.



6. Select the operation you wish to perform. Procedures for performing each operation are located in subsequent sections.

   After the requested operation is completed, the setup Welcome screen is again displayed. A confirmation message indicating completion of the operation is shown in the lower section of the dialog.



Indicates status of last operation.

7. After you have completed all desired operations, click **Exit** to close the dialog.

Installing Subsequent Software Versions

When you install a software upgrade, existing data files are not overwritten. There are three types of subsequent installations; the software version controlled by the setup program is:

- a later version than the version installed on the computer
- the same version as the version installed on the computer
- an earlier version than the version installed on the computer

The setup program automatically detects which type of installation applies and customizes the selection in the Setup dialog accordingly.

1. Start the Setup program. Refer to **Using the Setup Program for Other Functions**, page **4-10**.

2. Choose the software option (only the applicable option is displayed); it will be one of the following:

   - Upgrade software to version (number) from version (number)
   - Reinstall software version (number)
   - Downgrade software to version (number) from version (number)

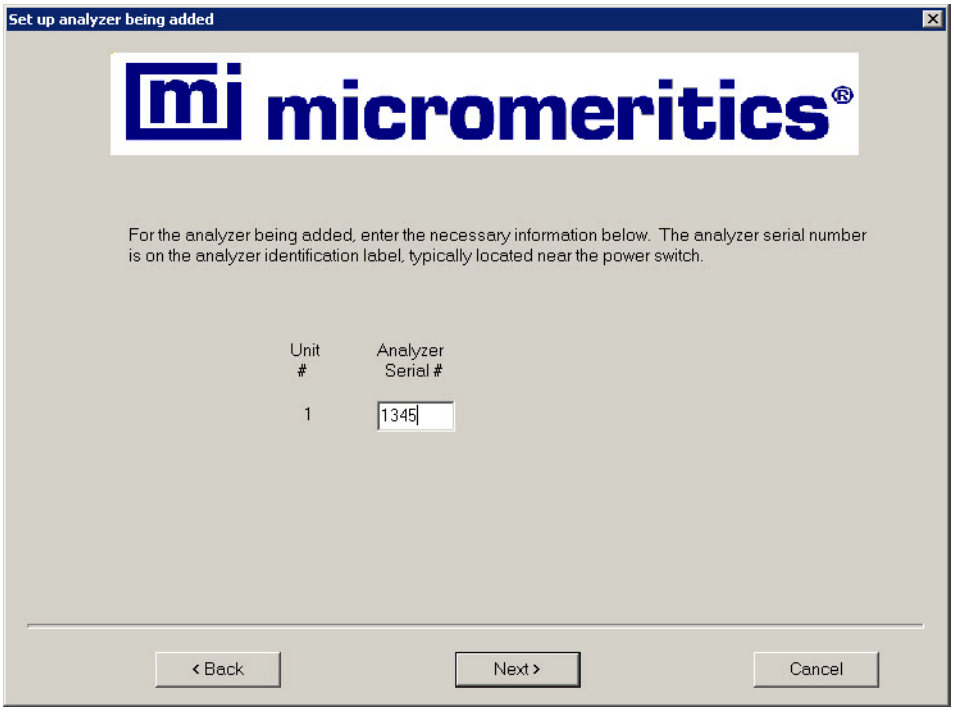
3. Click **Start File Installation**; the application installs the software and the setup Welcome dialog is displayed. If no other operations are desired using this dialog, click **Exit** to close the dialog.

Adding an Analyzer

This option it not available if a DVVI II 4000 is currently installed on the computer. If however, no analyzer is currently installed on the computer, either from removing the analyzer using the setup program, or if the software was originally installed with 0 instruments, you may use this option to attach an analyzer to the computer.

1. Start the Setup program. Refer to **Using the Setup Program for Other Functions**, page **4-10**.

2. In the Setup dialog choose Adding an Analyzer. The Setup analyzer being added dialog is displayed.



3. Enter the serial number of the analyzer, then click **Next**. The analyzer is added and the Welcome screen is again displayed.

4. Click **Exit** to close the dialog.

Moving an Analyzer from one PC to another PC

You can move your analyzer, along with its status files, from one computer (Source PC) to another computer (Destination PC).

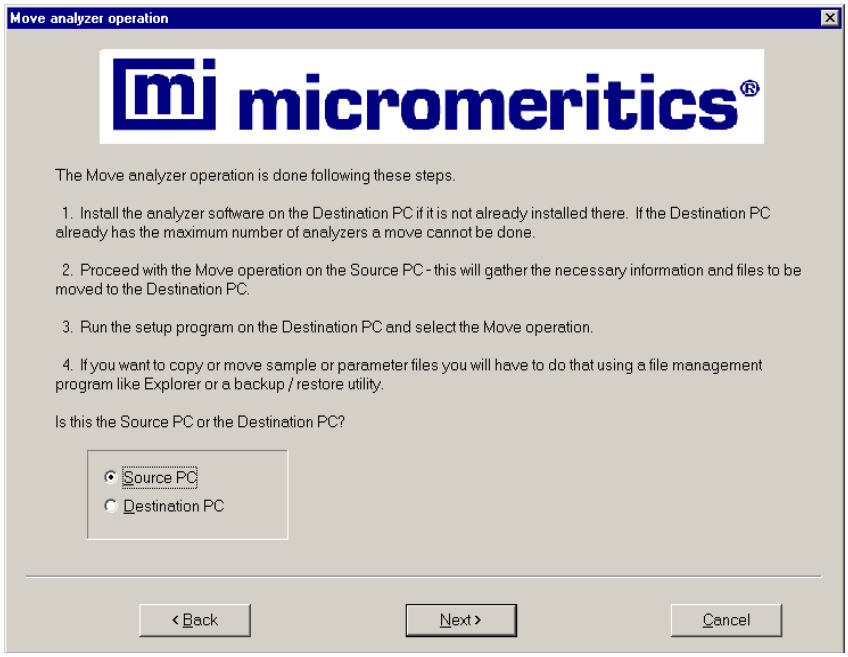
This operation does not move sample or parameter files. To move these files, use a file management program such as Explorer or a backup/restore utility.

1. Install the analysis program on the destination computer. Refer to **Installing the Software**, page **4-1**. Be sure to select **0** as the number of instruments; all related instrument information will be transferred in the **Move** operation.

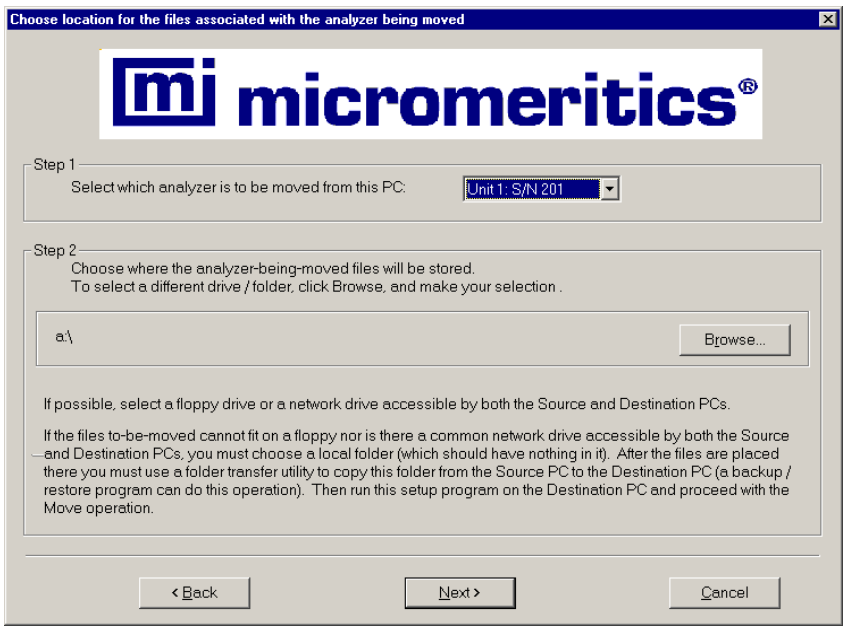
   If the analysis program is already installed on the destination computer, proceed to Step 2.

2. Start the application setup program on the source computer. Refer to **Using the Setup Program for Other Functions**, page **4-10**.

3. In the Setup dialog, select **Move an analyzer from one PC to another PC**, then click **Next**; the Move analyzer operation dialog is displayed.



4. Select **Source PC**, then click **Next**; the following dialog is displayed.



5. In the Step 1 group box, select the analyzer that is to be moved.

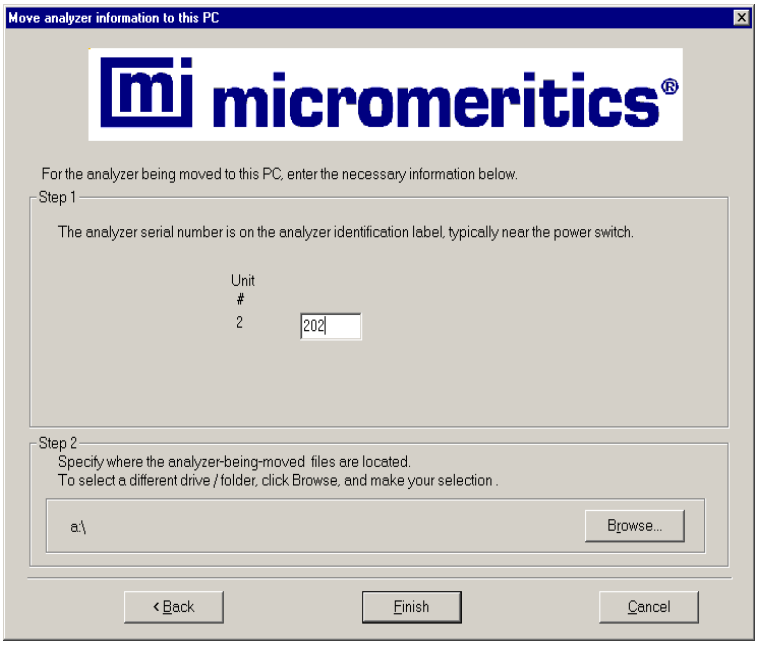
6. In the Step 2 group box, choose a location in which the moved files will be stored. If possible, choose a drive that will accommodate removable media or a shared network drive. If this is not possible, select a local folder. After the files are placed there, use a folder transfer utility to copy this folder from the **Source PC** to the **Destination PC**.

7. Click **Next**; the files are moved and the setup Welcome screen is displayed.

8. Start the application setup program on the destination computer.

9. In the Setup dialog, select **Move an analyzer from one PC to another PC**; the Move analyzer operation dialog is displayed (shown on previous page).

10. Select **Destination PC**, then click **Next**; the following dialog is displayed.



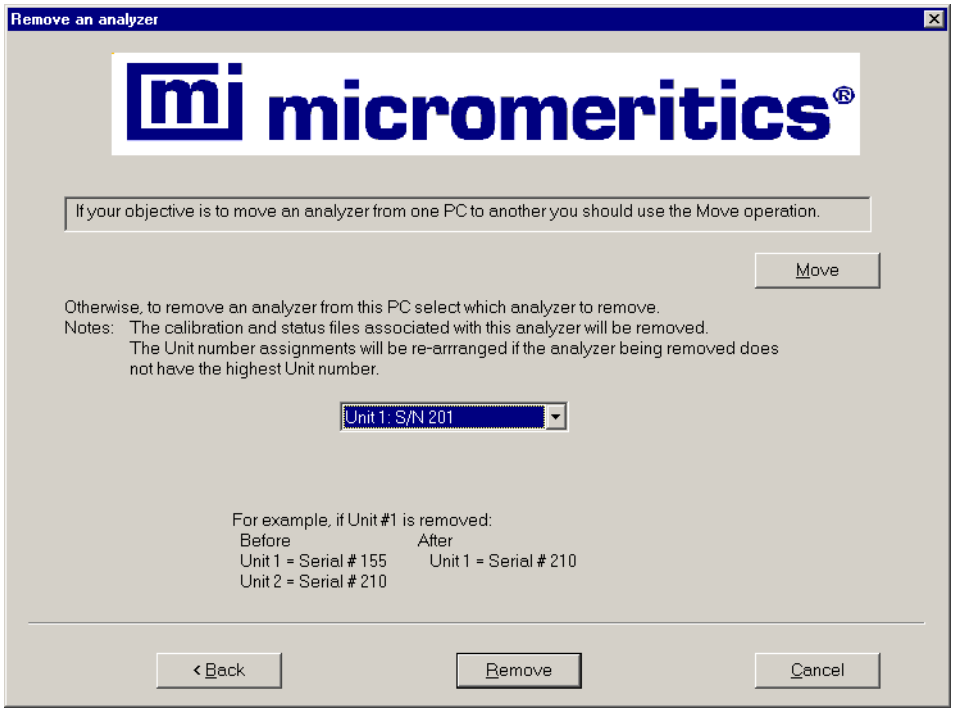
11. In the Step 1 group box, enter the serial number of the analyzer you are moving to this PC.
12. In the Step 2 group box, click **Browse** and choose the location of the moved files.
13. Click **Next**; the files are moved and the setup Welcome dialog is displayed.
14. Click **Exit** to close the dialog.

Removing the Analyzer

You can remove the analyzer from the computer as follows. When you remove the analyzer, the status files also are removed; data files are not.

1. Start the Setup program. Refer to **Using the Setup Program for Other Functions**, page **4-10**.

2. From the Setup dialog, select **Remove an analyzer**, then click **Next**; the Remove an analyzer dialog is displayed.



3. From the drop-down list, choose the serial number of the analyzer you want to remove.

4. Click **Remove**; the analyzer is removed and the Welcome screen is again displayed.

5. Click **Exit** to close the dialog.

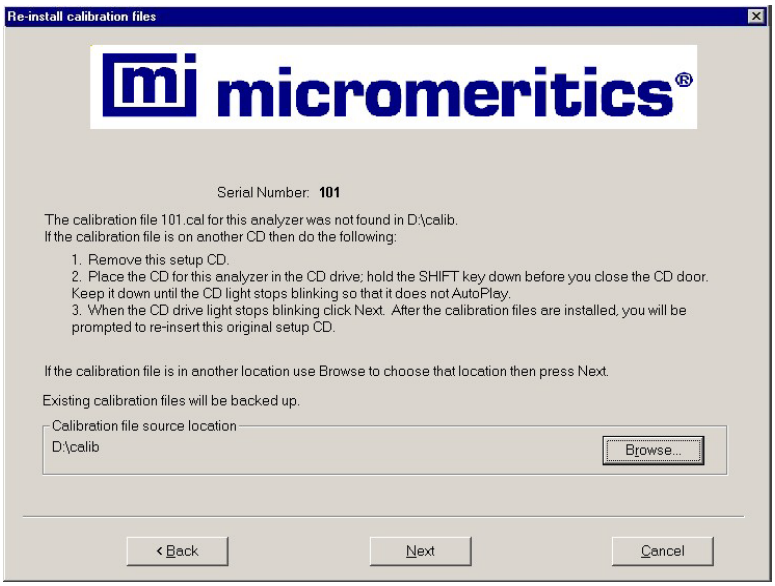
Reinstalling Calibration Files

Calibration files specific to the analyzer are contained on the original program CD; they are not contained on an update CD. It is important that you store your original program CD in a safe location. Part numbers for CDs containing calibration files have a suffix of **99**. Part numbers for Update CDs have a suffix of **00**.

Reinstall calibration files as follows:

1. Start the Setup program. Refer to **Using the Setup Program for Other Functions**, page **4-10**.

2. Select **Re-install calibration files for an analyzer**, then click **Next**; the Re-install calibration files dialog is displayed.



If you did not use the original program CD to start the Setup program, you will have to insert it now since it contains the calibration files. You do not have to exit the Setup program. Simply remove the CD and insert the program CD.

3. Ensure that the CD drive is displayed as the **Calibration file source location**. If not, click **Browse** and choose the CD drive.

4. Click **Next**; the calibration files are reinstalled and the Welcome dialog is displayed.

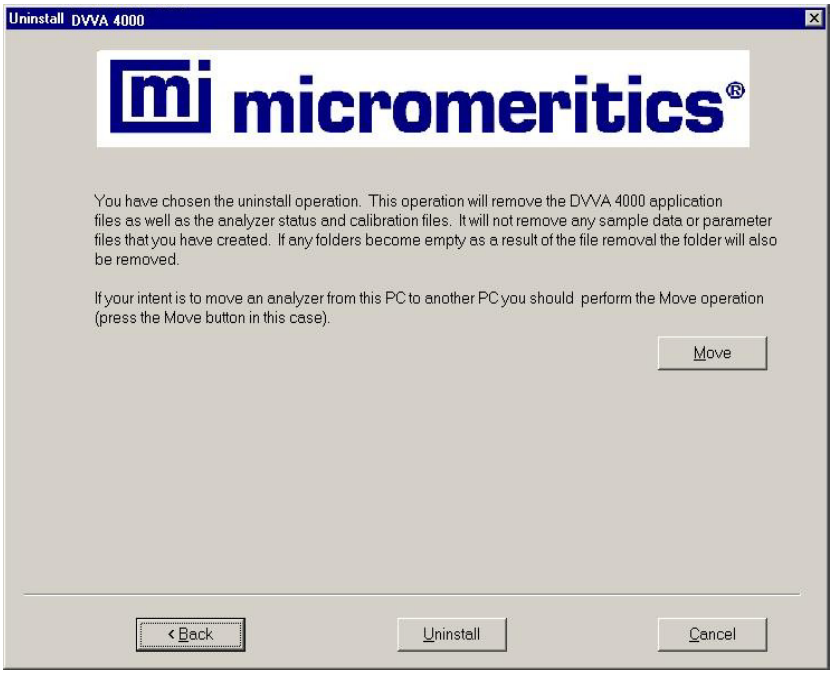
5. Click **Exit** to close the dialog.

Uninstalling the Analysis Program

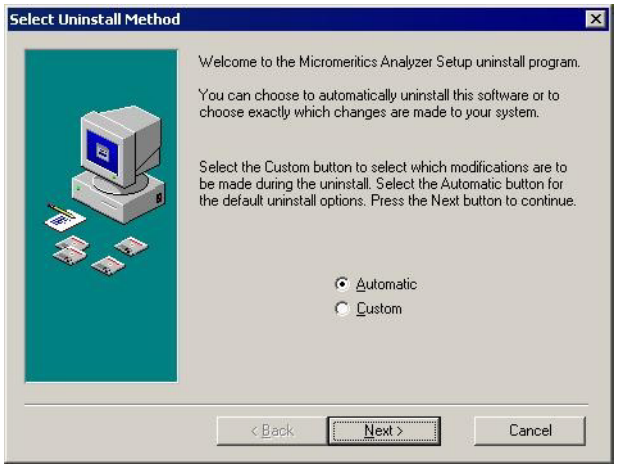
When you uninstall the DVVA II program, the application removes the analysis program, status files, analyzer setup files, and resulting empty directories. It does not remove data files. Perform the following steps to uninstall the program:

1. Start the Setup program. Refer to **Using the Setup Program for Other Functions**, page **4-10**.

2. From the Setup dialog, select **Uninstall**, then click **Next**; the Uninstall dialog is displayed.



3. Click **Uninstall**; the Select Uninstall Method dialog is displayed.



4. Choose one of the following:

   - **Automatic**: click **Next**; the Perform Uninstall dialog is displayed confirming the uninstall operation. Click **Finish** to uninstall the analysis program; the setup Welcome dialog redisplays.

   - **Custom**: click **Next**; a series of dialogs is displayed, allowing you to choose the files you wish to uninstall. After all files are selected and uninstalled, the setup Welcome dialog redisplays.

5. Click **Exit** to close the Welcome dialog.

5. FILE MENU

The File menu contains options which allow you to manage sample and parameter files.

Description

Open Open an existing sample or parameter file, or create a new one. Page **5-2**.

Save Save the file in the active window. Page **5-27**.

Save As Save the file in the active window as a different name, or a subset of the sample file as a parameter file. Page **5-27**.

Save All Save all open files. Page **5-27**.

Close Close the file in the active window. Page **5-27**.

Close All Close all open files. Page **5-27**.

Print Print the contents of a sample or parameter file. Page **5-28**.

List Generate file statistics for sample or parameter files. Page **5-30**.

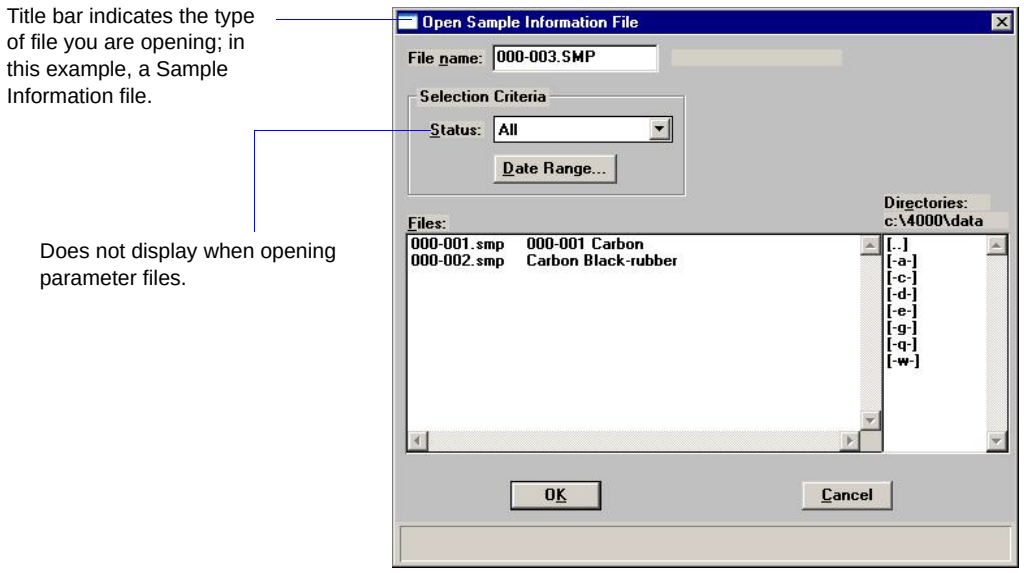
Export Export analysis data. Page **5-32**.

Exit Exit the DVVA II application. Page **5-33**.

Open

Open allows you to create a new sample or parameter file, or to open an existing one.

When you open a sample or parameter file, a dialog similar to the one shown below is displayed.



File name

For *sample information* files: contains the next sequenced file name (number) generated by the software. If this is a new file, you can accept this number or you can enter a name consisting of up to eight characters.

For *parameter files*: displays an asterisk (*) and a default extension:

*.ANC for analysis conditions
*.RPO for report options

If this is a new file, enter a name in the **File name** field. You can enter up to eight characters.

Status
Date Range
Directories

Refer to **Selecting Files**, page **2-10** for a description of these fields.

Files list

Lists the files contained in the selected directory of the type chosen in the **Status** field and within the selected date range. The first column in the list is the file name (number). The second column is the description entered in the file.

If you are opening an existing file, simply select the file and click **OK** (or double-click on the file).

Sample Information

Sample information files consist of the following:

- sample identification
- analysis conditions
- report options

Parts of the sample information file can also exist as parameter files which are separate from the sample information file itself. Having these files exist independently allows you to use them as many times as you wish. For example, if you typically use the same analysis conditions for many of your analyses, you can create an analysis conditions file containing those conditions. Then when you create your sample file, select that file for your analysis conditions. After it becomes part of the new sample file, you can edit it in any way you wish without changing the file from which it was copied.

Sample information files are presented in three formats: Advanced, Basic, and Restricted.

Specify or change your format by selecting Options > Option presentation.

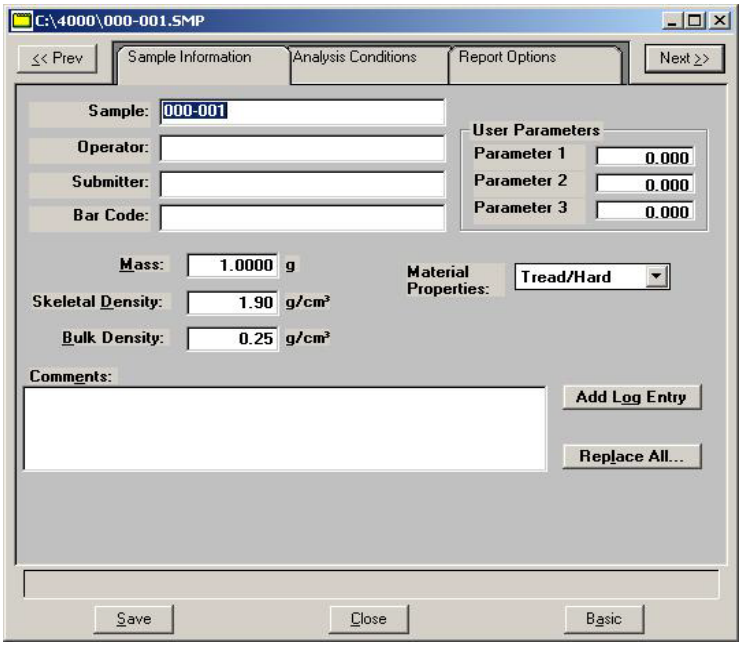
- **Advanced**
  Presents all parts of the sample information file in a tabbed dialog, allowing easy access to each parameter. Use this format to customize files.

- **Basic**
  Presents the sample information file in a single dialog. This format allows you to quickly create a sample information file using previously defined parameter files. You also can switch to the Advanced format to view or edit parameters.

- **Restricted**
  Presents the sample information file in a single dialog similar to the Basic format. This format, however, does not allow you to switch to the Advanced format. Some menu items also are unavailable.

Advanced

The Advanced format displays all parts of the sample file in a tabbed dialog, allowing easy access to each parameter. Simply click the desired tab or use the **Prev** and **Next** push buttons to access the parameter dialogs. Refer to **Advanced Format**, page **3-5** for step-by-step instructions on creating a sample information file using the Advanced format.



Sample

Displays the current file's description. If this is a new file, the description specified in sample defaults is displayed. The sample file name (number) is shown in the example above because the dollar ($) sign was used in Sample Defaults. You may enter a new description or edit the existing one.

Range: *50 alphanumeric characters*

Operator
Submitter

Enter the name of the operator who will be performing the analysis and the name of the person (or department) submitting the sample for analysis.

Range: *40 alphanumeric characters*

The label(s) for these fields can be edited or omitted from displaying at all using the options available in **Sample Defaults**, page **8-6**.

Bar code

This field enables you to enter bar code information. If bar code information is not used, you can use this field to enter additional information about the sample; for example, you may wish to enter the lot number of your sample.

This field, as well as other fields on the dialog, accepts data from a bar code reader. A bar code reader can be attached to one of the USB connectors on the computer. Simply scan the bar code and the number transfers to the highlighted field.

Range: 40 alphanumeric characters

The label for this field may be customized to display differently or omitted from displaying at all using the options available in **Sample Defaults**, page **8-6**.

Mass

Enables you to enter the mass of the sample; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.

Skeletal Density

Enables you to enter the skeletal density (also known as the true density) of your sample.

Bulk Density

Enables you to enter the bulk density (sometimes referred to as pour density) of your sample.

User Parameters

The fields in this group box can be used for SPC (Statistical Process Control) reporting. They are used to specify characteristics of the sample or its manufacturing process, as well as to enter constants to be included in User Model formulae.

Once specified, these parameters display on the sample editor and in the SPC Sample Options dialog.

These fields can also be used to record analysis conditions or sample information so that it can be printed on the Summary report.

If desired, you can have these fields omitted from the sample information file (refer to **Sample Defaults**, page **8-6**).

Comments

Enter comments about the sample or its analysis conditions. Comments entered here are printed in the header of the reports. This field will accept up to 500 characters.

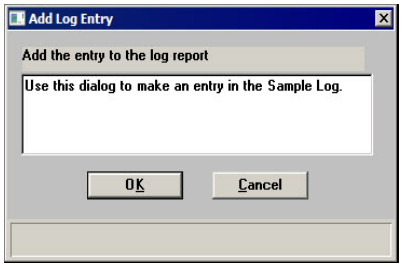
Material Properties

Enables you to choose the type of sample material you are analyzing.The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated.

Choose **Other** only when your material is something other than **Tread/Hard** or **Carcass/Soft**.

Add Log Entry

Displays the Add Log Entry dialog



This dialog enables you to enter analysis and/or sample criteria (not recorded automatically by the analysis program) to display in the Sample Log report. You can make multiple entries by selecting this push button as many times as you wish.

Replace All

Allows you to replace the values of the current sample file with those from an existing one. A dialog is displayed so that you may select the file. The values are copied into the file; you may edit them as needed. This replaces all parameters of the entire sample information file.

Each of the individual tabbed dialogs contain a Replace push button if you wish only to replace specific parameters and not the entire contents.

Save

Saves the information you have specified for this sample file.

Close

Closes the dialog. If a file containing unsaved changes is open, you are prompted to save before the dialog closes.

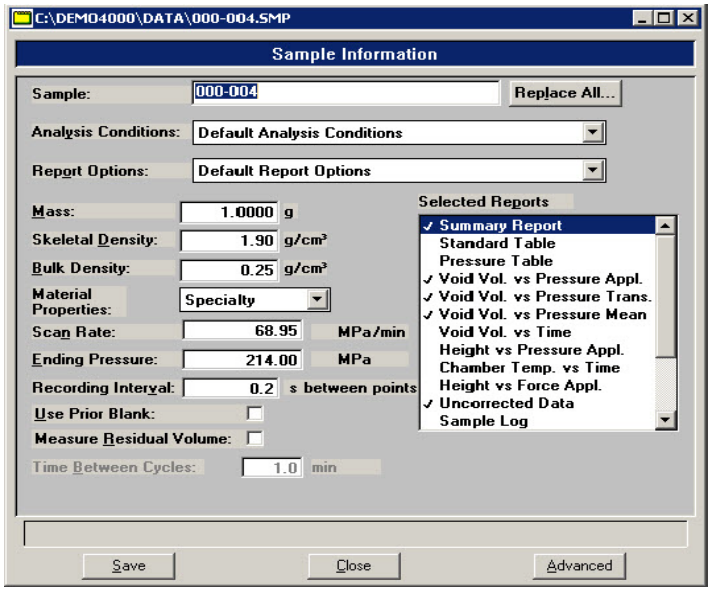
Basic

Displays the sample information file in the basic format.

Basic

The Basic format displays all parameters in a single, non-tabbed dialog. This format allows you to create a sample information file using previously defined parameter files. You can also switch to the Advanced format to view or edit parameters.

Refer to **Basic and Restricted Formats**, page **3-8** for step-by-step instructions for creating a Basic sample information file.



Sample

Displays the current file's description. If this is a new file, the description specified in sample defaults is displayed. You may enter a new description or add to the existing one.

Range: 50 alphanumeric characters

Replace All

Allows you to replace the values of the current sample file with those from an existing one. A dialog is displayed so that you may select the desired file. After you have copied the values into the current file, you may edit them as desired.

Analysis Conditions

Contains predefined Analysis Conditions files, some of which were included with the analysis program. If this is a new file, this field contains the one you specified as the default.

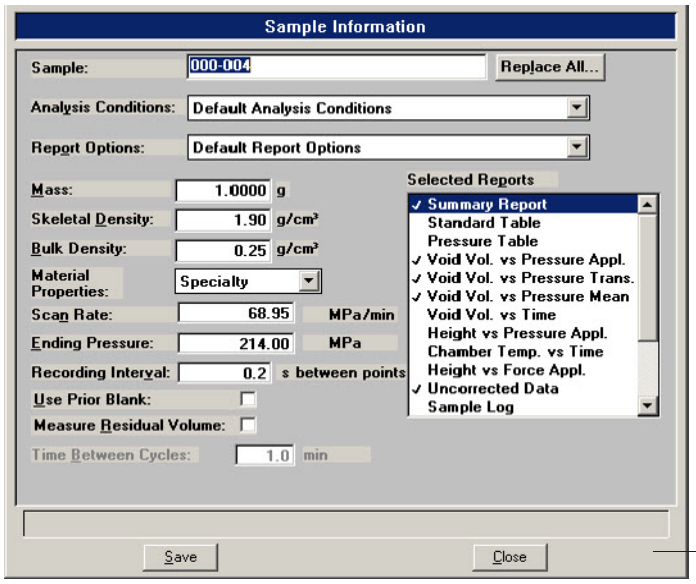
Click **Advanced** to view or edit file values.

Report Options	Contains predefined Report Options files, some of which were included with the analysis program. If this is a new file, this field contains the one you specified as the default. Click **Advanced** to view or edit file values.
Mass	Enables you to enter the mass of the sample; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.
Skeletal Density	Enables you to enter the skeletal density (also known as the true density) of your sample.
Bulk Density	Enables you to enter the bulk density (sometimes referred to as pour density) of your sample.
Material Properties	Enables you to choose the type of sample material you are analyzing.The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated. Choose **Other** only when your material is something other than **Tread/Hard** or **Carcass/Soft**.
Scan Rate **Ending Pressure** **Recording Interval** **Use Prior Blank** **Measure Residual Volume** **Time Between Cycles**	These fields display the values and options for the selected Analysis Conditions file; they may be edited if needed. Editing the fields in the dialog does not change the values in the Analysis Conditions file. Refer to **Analysis Conditions**, page **5-10** for a description of these fields.
Selected Reports	Contains a list of available reports. The ones selected for the current Report options file are indicated with a check mark; you may select additional reports to generate if desired.
Save	Saves the information you have specified for this sample file.
Close	Closes the dialog. If a file containing unsaved changes is open, you are prompted to save before the dialog closes.
Advanced	Displays the sample information file in the advanced format, allowing you to view or edit parameters.

Restricted Format

The Restricted format is used when analysis parameters must remain constant. A password is required to enter and exit this format. Refer to **Restricted**, page **8-5** for additional information on the Restricted format.

The Restricted format displays in the same manner as the Basic format. Some menu functions, however, are disabled and you cannot switch to the Advanced format to edit file parameters.



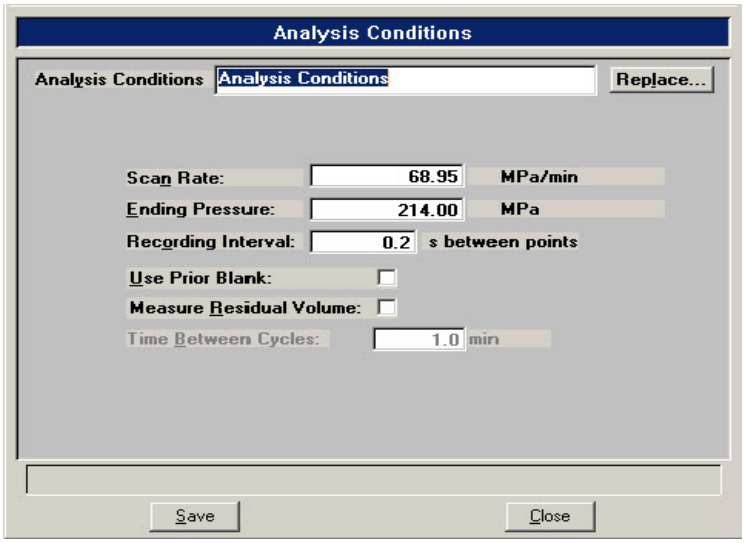
The Restricted format does not contain an Advanced push button allowing you to switch to the Advanced format.

Refer to **Basic and Restricted Formats**, page **3-8** for step-by-step instructions for creating a Restricted sample information file

Analysis Conditions

This dialog enables you to specify the analysis conditions for your sample. An analysis conditions file can exist as an independent parameter file or as part of the sample information file.

Be sure to save this file to the directory you specified as the Parameter Files directory if it is to be included in the drop-down list of the Basic Sample Information dialog (see Parameter Files Directory, page 8-20).



Analysis Conditions — Displays the description of the current file. If this is a new file, the description specified in sample defaults is displayed. You may enter a new description or add to the existing one.

Range: *40 alphanumeric characters*

Replace — Allows you to replace the values in the current file with those from an existing one. After the values are copied into the file, you can edit them as required.

Scan Rate — Enter the rate at which pressure is to increase during analysis.

Ending Pressure — Enter a pressure at which to end the analysis.

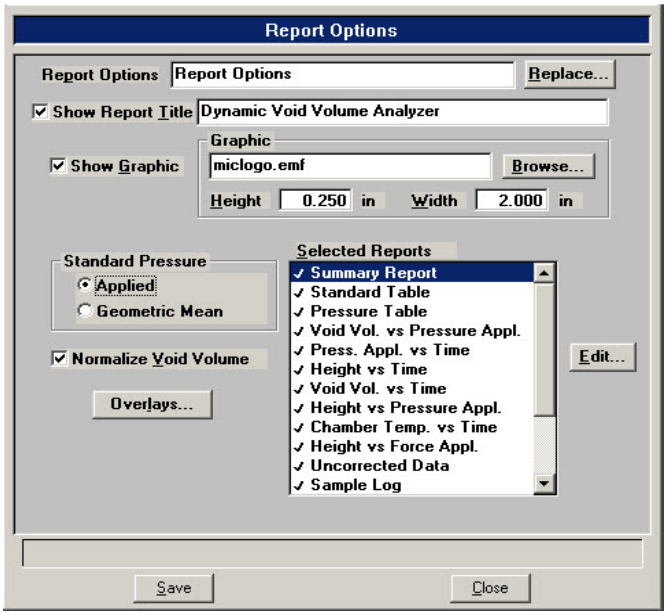
Recording Interval — Enter the interval for recording data points.

Use Prior Blank	Skips the blank analysis automatically performed before each analysis and uses the data from the previous blank analysis. When using this option for your sample analysis, the height of sample material in the sample chamber must be higher than that used in the blank analysis.
Measure Residual Volume	Allows you to measure the void volume of the compressed sample. At the end of the compression cycle, the upper piston withdraws and a single-point measurement is collected. This point defines the top of compressed sample and is used to calculate the residual void volume.
Time Between Cycles	Enter how many minutes to wait after the completion of the compression cycle before taking the single-point measurement.

Report Options

This dialog allows you to specify report options for your analysis. A report options file can be created as an independent parameter file or as part of the sample information file.

Be sure to save this file to the directory you specified as the Parameter Files directory if it is to be included in the drop-down list of the Basic Sample Information dialog (see Parameter Files Directory, page 8-20).



Report Options

Displays the description of the current file. If this is a new file, the description specified in sample defaults is displayed. You may enter a new description or edit the existing one. Use an intuitive description that will help you to recognize it for future use. You may enter up to 40 alphanumeric characters.

Replace

Allows you to replace the values in the current file with those from an existing one. After the values are copied into the file, you can edit them as needed.

Show report title

Enables you to have a title appear on your report and provides a field for entering the text. You can enter up to 50 alphanumeric characters.

Show graphic

Select this option to have a graphic display above the report title. The graphic can be a bitmap (bmp) or an enhanced metafile (emf). For example, you may wish to display your company logo.

Click **Browse** to choose the graphic, then enter the height and width in the appropriate fields. This image can be edited, or removed, from the report window.

Standard Pressure

Choose the type of pressure to be interpolated for the user defined tabular reports, the Summary Report, the Pressure Table Report, and the void volume normalization.

Applied: the force of the upper piston only

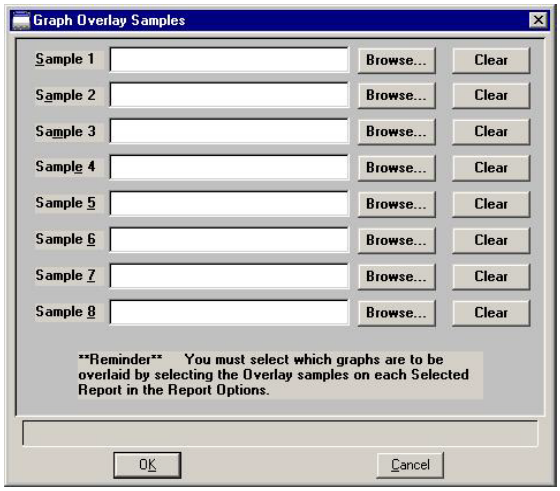
Geometric Mean: calculates a geometric mean of the applied (upper piston) and transmitted (lower piston) forces.

Normalize Void Volume

Select this option to have the void volume normalized.

Overlays

Displays the Graph Overlay Samples dialog.



Click **Browse** to choose the file(s) you wish to use in the overlay. You may select up to eight files. Use **Clear** to clear a field of its entry.

After choosing the file(s), select the **Overlay samples** option for each report type you plan to overlay. Refer to **Multiple Samples Overlay**, page **3-23** for step-by-step instructions.

Selected Reports

Contains a list of available reports:

- Summary Report
- Standard Table
- Pressure Table
- Void Vol. vs Pressure*
- Pressure Appl. vs Time*
- Height vs Time*
- Void Vol. vs Time*
- Height vs Pressure Appl.*
- Chamber Temp. vs. Time*
- Height vs. Force Appl.*
- Uncorrected Data
- Sample Log
- Modified Heckel
- Kawakita
- Bauer
- Wu
- Cooper-Eaton

*Default names for Trend plots. These plots can be edited and customized as desired. Refer to **Trend Plots**, page **5-20** for details.

Highlight the desired report and double-click the left mouse button, or press the **Spacebar** to select a report. A report is selected when it is preceded with a check mark (✓); it is deselected in the same manner.

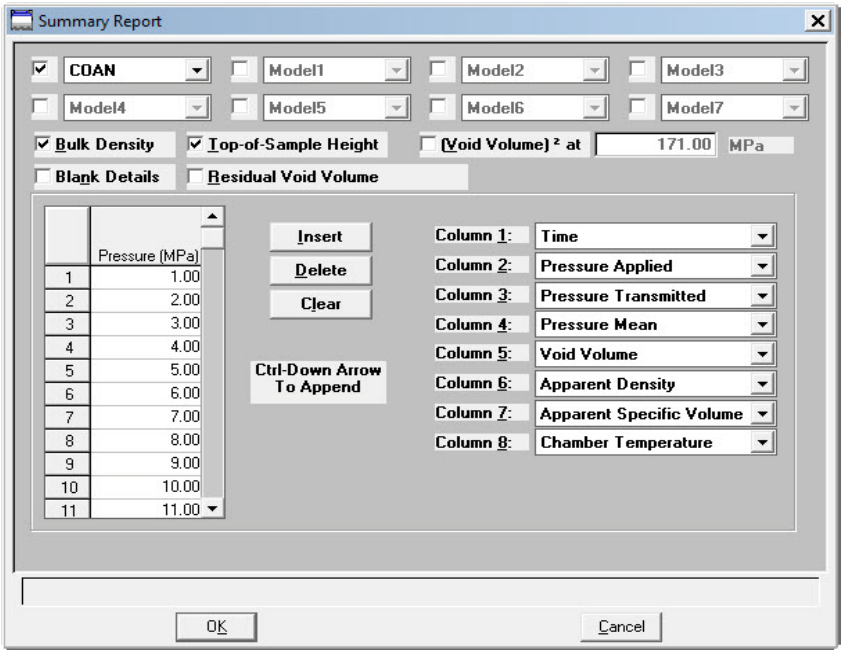
Edit

Displays a dialog for the selected report. Editing options for available reports are shown in subsequent sections.

This button is disabled for the Sample Log report and Uncorrected Data; the parameters for these reports cannot be edited.

Summary Report

The Summary report enables you to generate a condensed report of information on COAN, user-specified Models, density, and void volume at specified pressures.



COAN
Model 1 through 7

Enables you to select models to appear on the summary report. You may select up to 8 models.

If this file is part of a sample information file, only those models that apply to the selected material type are contained in the drop-down lists.

If this file is not part of a sample information file, all models in the system are shown in the drop-down lists.

The Material type, selected on the Sample Information dialog is used to determine which carbon property models are used for a particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you selected **Other** for Material type, the COAN is not calculated.

Bulk Density

Includes the bulk density calculated from the software determination of the top of the sample.

Top-of-Sample Height	Calculates the distance from the top of the sample chamber to sample contact.
Void Volume	Reports the void volume at a specified pressure.
Blank Details	Provides the stored parameters for the blank analysis.
Residual Void Volume	Reports residual void volume of the sample. Includes the residual top-of-the sample height, the residual force measured on the lower load cell, and the hold time.
Pressure Table	Enables you to specify up to 999 pressure points at which to interpolate collected data; less than 10 is typical. Use the **Insert**, **Delete**, and **Clear** push buttons and **Ctrl + Down Arrow** to assist you in creating your table.
Insert	Inserts a line above the selected line.
Delete	Deletes the selected line.
Clear	Clears the table of all entries except one; one is required.
Ctrl + Down Arrow	Appends a new line at the bottom of the table.

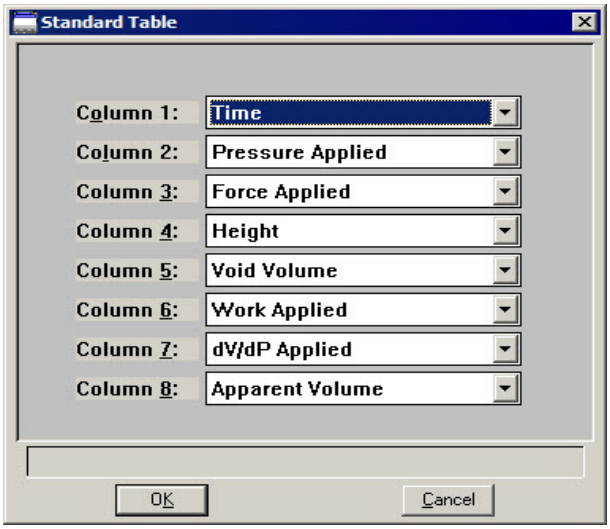
Column [n]

Enables you to select up to eight columns to appear on the report. The drop-down lists contain the following variables:

- Time
- Apparent Volume
- Pressure Applied
- Apparent Specific Volume
- Pressure Transmitted
- Apparent Density
- Pressure Mean
- Apparent Relative Density
- Force Applied
- Axial Strain
- Force Transmitted
- Void Ratio
- Force Mean
- Work Applied
- Height
- Work Mean
- Void Volume
- dV/dP Applied
- Ambient Temperature
- dV/dP Mean
- Chamber Temperature

Standard Table

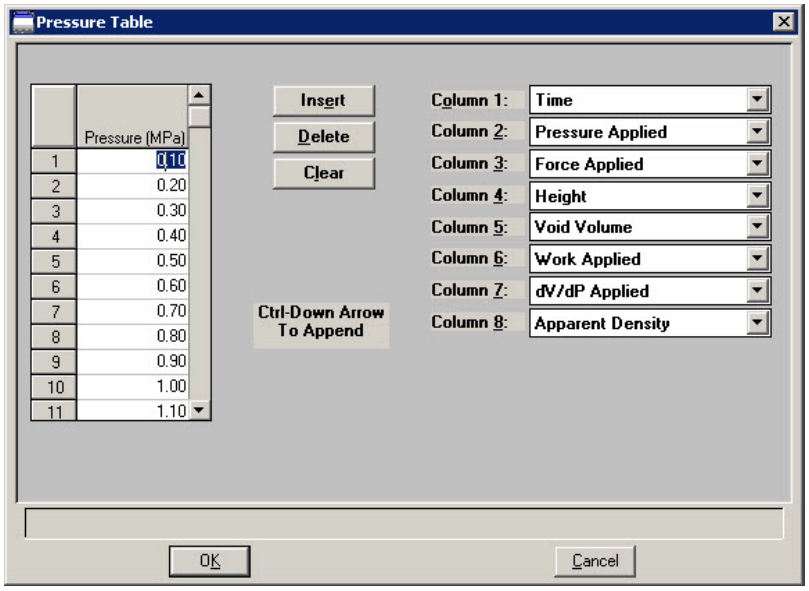
The Standard Table report contains the data points collected during analysis and can display up to 8000 points.



You can display up to eight columns on the report. The drop-down lists contain the variables listed on page 5-17.

Pressure Table Report

The Pressure Table report allows you to enter a set of pressures at which to interpolate the collected data; the Pressure Table dialog is displayed.



Pressure Table

Enables you to specify up to 999 pressure points at which to interpolate collected data. Less than 10 is typical for most users.

Use the **Insert**, **Delete**, and **Clear** push buttons to assist you in creating your table.

Insert

Inserts a line above the selected line.

Delete

Deletes the selected line.

Clear

Clears the table of all entries except one; one is required.

Ctrl + Down Arrow

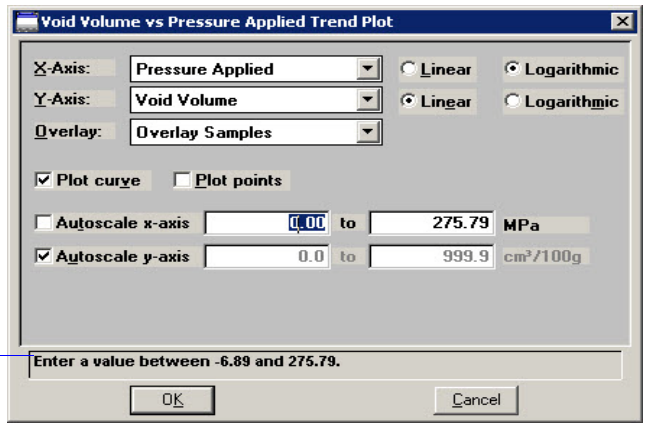
Appends a new line at the bottom of the table.

Column [n]

Enables you to choose up to eight different variables for your report. The drop-down lists contain the variables listed on page 5-17.

Trend Plots

There are seven trend plots listed in the **Selected Reports** window. These plots can be generated as shown, or they can be customized. The report title is based on the parameters displayed for the x- and y-axes. For example, this report's title is Void Volume (Y-axis variable) vs. Pressure Applied (X-Axis variable) Trend Plot.



Displays the range for the selected field.

Each time you change the X- or Y-axis variable, the change is reflected in the title bar. Graphs and tables will display a maximum of 8000 points. *All* data points will be displayed if the number of points is less than or equal to 8000; *every other* data point will be displayed if the number of points is in the range of 8001 to 16000; and so forth.

X-Axis
Y-Axis

These drop-down lists contain the variables available for the X- and Y-axes (refer to page **5-18**).

Linear
Logarithmic

Enables you to plot the axes on a linear or logarithmic scale.

Overlay

Contains choices for overlaying plots. From this drop-down list, you can select:

- another variable to overlay with the variable shown in the **Y-Axis** field, or
- **Overlay Samples** to overlay data of the type selected in the **Y-Axis** field with the same type of data contained in other sample files. The other sample files are selected by clicking Overlays on the Report Options dialog.

Choose **None** if you are not generating overlays.

Plot curve **Plot points**	Choose the manner in which data are plotted; as a curve, points, or both.
Autoscale x-axis **Autoscale y-axis**	Scales the X- and/or Y-axes automatically. Deselect **Autoscale** to enter a range in which to scale data.

Uncorrected Data Report

The Uncorrected Data report displays the data from the blank analysis and the sample analysis before being corrected; it cannot be edited.

Sample Log Report

The Sample Log report displays the following; it cannot be edited:

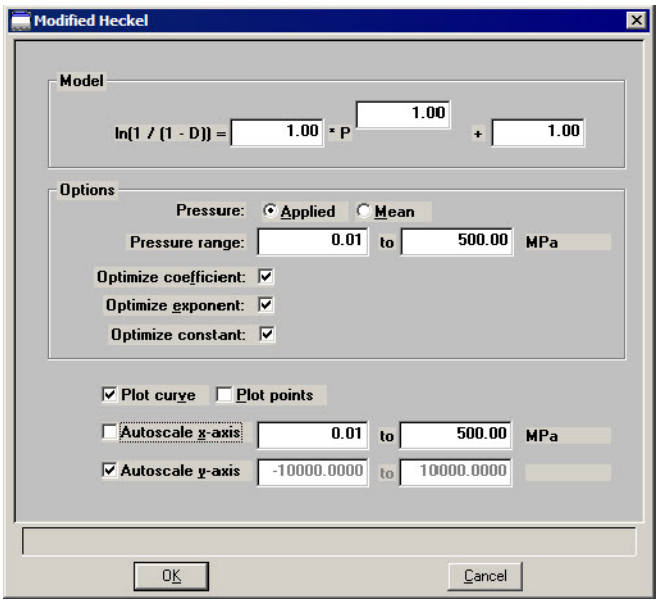
- Automatic operations
- Information entered using **Add Log Entry** on the sample file editor
- Warnings and/or errors which occurred during analysis

Compression Reports

Compression reports allow you to have your data overlaid with model data. You can choose the optimize options for the equation to have the model data more closely fit the analysis data.

Modified Heckel Report

The original Heckel equation was developed and applied on ceramic and metal materials and, later, modified for compaction of powders where the porosity is substituted for concentration and pressure substituted for time.



Model — Displays equation parameters for the modified Heckel model.

Options

Applied: reports the force applied from the upper piston only.

Mean: reports the geometric mean of the force applied from the upper and lower pistons.

Pressure range: the pressure range on which the model is overlaid; defaults to entire range.

Optimize [equation parameter]: when selected, the software recalculates model parameters in order to best fit the model with the data.

Plot curve
Plot points

Choose the manner in which data are plotted; as a curve, points, or both.

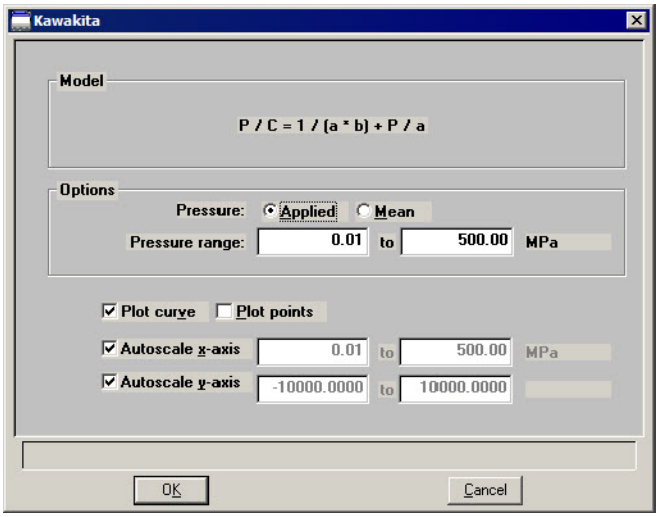
Autoscale x-axis
Autoscale y-axis

Scales the X- and/or Y-axes automatically.

Deselect **Autoscale** to enter a range in which to scale data.

Kawakita Report

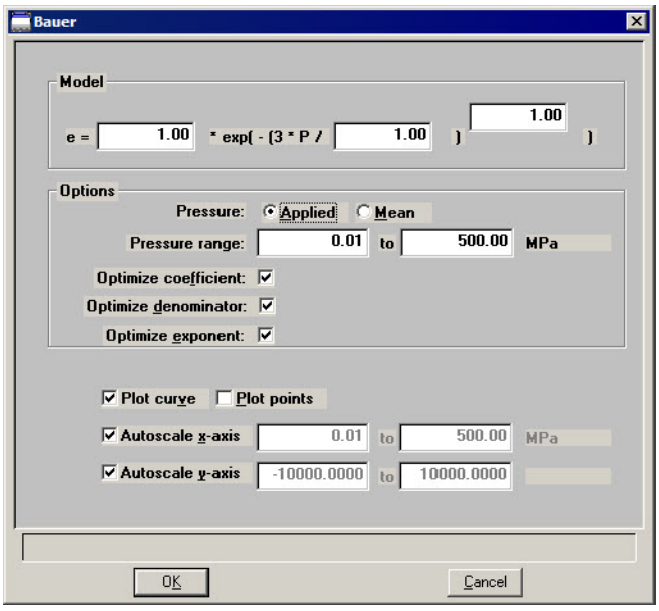
The Kawakita equation has received considerable attention in the field of powder compaction. It tends to provide a good straight line throughout the range of pressures over which they are plotted, although some may show curvature at the low-pressure end.



Refer to **Modified Heckel Report**, page **5-22** for an explanation of the fields on this dialog.

Bauer Report

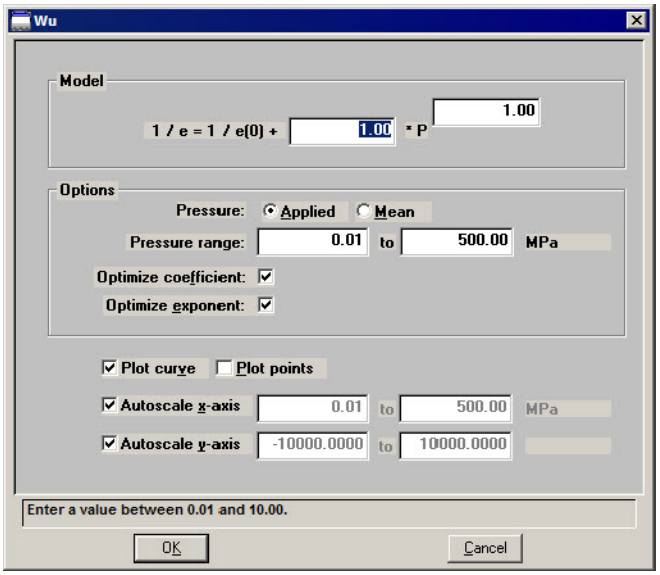
Bauer proposed that the maximum void ratio, the minimum void ratio, and the critical void ratio are pressure-dependent. Plotting the void volume, porosity, and/or apparent density using the Bauer model provides a good fit for carbon black curves.



Refer to **Modified Heckel Report**, page **5-22** for an explanation of the fields on this dialog.

Wu Report

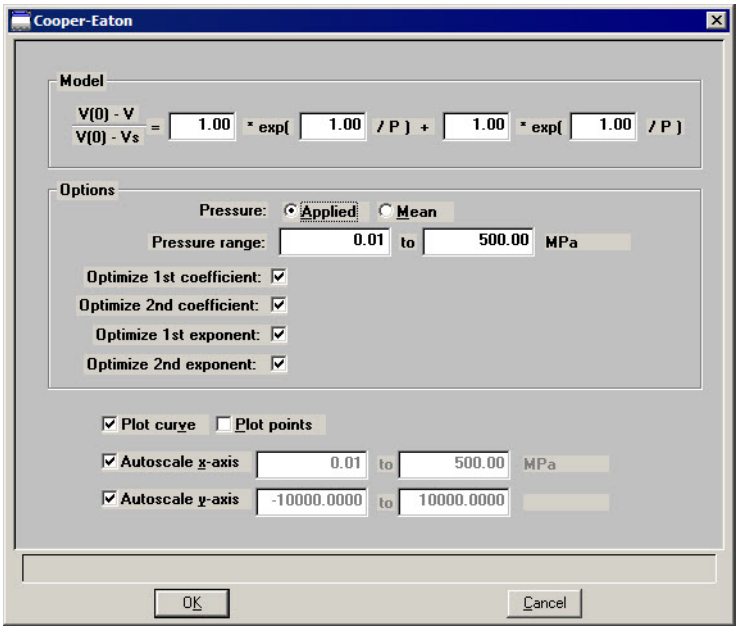
The Wu equation was developed to describe the pressure and density dependency of soil. For granular soils, the stress response to a strain input depends explicitly of density, and the tangential stiffness depends on pressure in a way which is weaker than linear.



Refer to **Modified Heckel Report**, page **5-22** for an explanation of the fields on this dialog.

Cooper-Eaton Report

The Cooper-Eaton equation is based on the assumption that compression of powder is a process that takes place in two stages, where stage 1 is filling voids, and stage 2 is fragmentation and deformation of the particles.



Refer to **Modified Heckel Report**, page **5-22** for an explanation of the fields on this dialog.

Save

Saves any changes you have made to the file in the active window. The file is saved under its current name.

Save As

Enables you to:

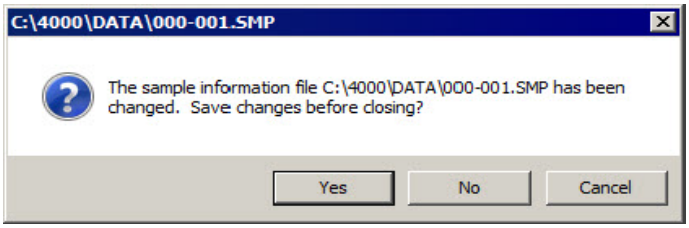
- save a sample or parameter file in the active window under a different name. This option is useful for making a duplicate copy of a file that you can modify as desired without changing the original one. The original file remains open when you use this function, so be sure to open the new file before making any changes.
- save a subset (parameter) of the sample file in the active window as a standalone parameter file. For example, select Analysis Conditions from the **Save As** menu to create a standalone parameter file of the analysis conditions portion of the active sample file.

Save All

Saves all open files under their current names. This option provides a faster way to save all open files at one time and avoids having to perform a **Save** operation on each individual file.

Close

Closes the current file. The following message is displayed if changes have been made to the file:



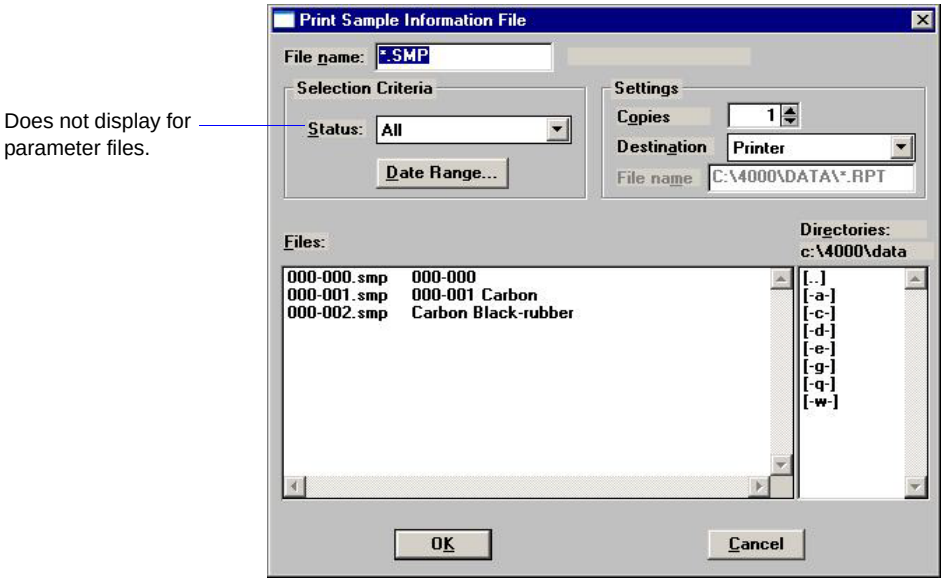
Yes saves the changes and closes the file.
No discards the changes and closes the file.
Cancel returns you to the open file.

Close All

Closes all open files. The message shown above for **Close** is displayed for each file in which changes have been made. The same actions apply.

Print

Enables you to print the contents of a sample or parameter file. You can choose multiple files by holding down the **Ctrl** key while making your selections. Regardless of which file type you select, a dialog similar to the one shown below is displayed.



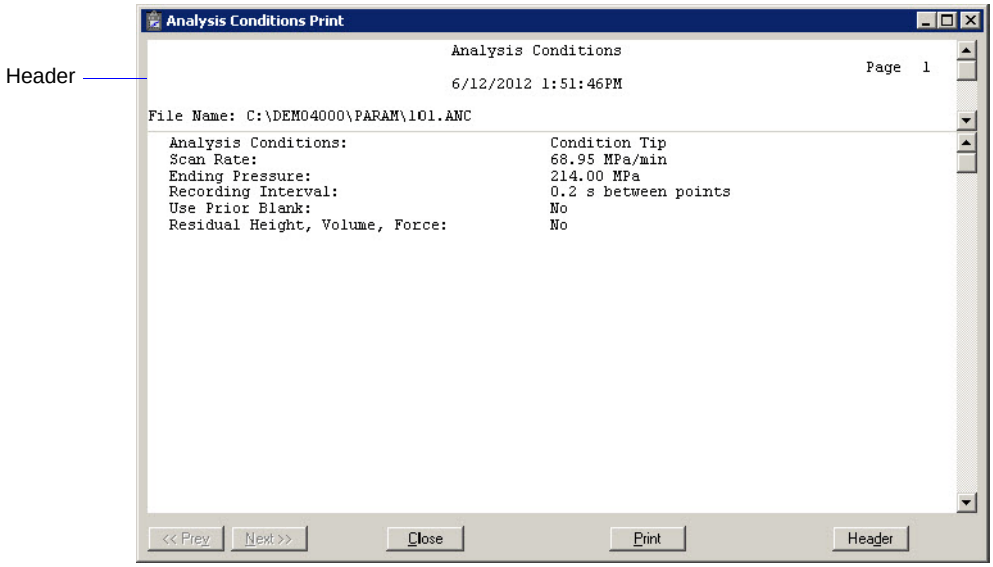
File name — Displays the name of the file you select from the **Files** list.

Status
Date Range
Files
Directories — These options are explained in **Selecting Files** beginning on page 2-10.

Settings — Enables you to choose output options. Select the down-arrow to the right of the **Destination** field to choose the destination:

- **Printer**: enables the **Copies** field allowing you to print up to four copies to a printer.
- **Screen**: prints the information to the screen.
- **File**: generates a text file which can be viewed with a text editor or other text file manipulation tool. Also enables the **File name** field so that you can enter a name for the file (or you can accept the default).

This example shows an Analysis Conditions file printed to the **Screen**.



Close Closes the dialog

Print Prints the report to the default printer

Header Toggles the header on and off

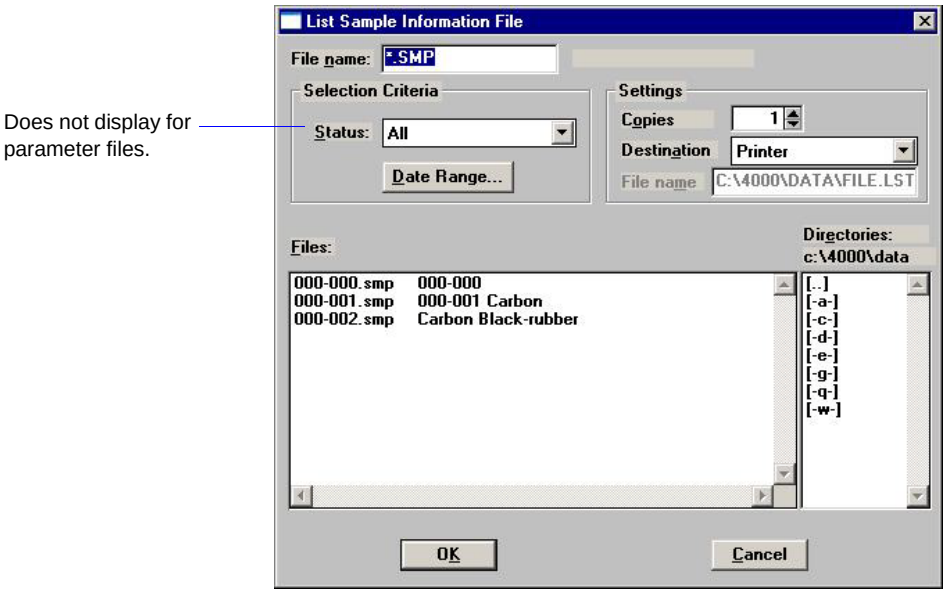
Prev
Next Enabled when the report contains multiple pages allowing you to advance to other pages

List

Generates the following information on a selected sample or parameter file. You can choose multiple files by holding down the **Ctrl** key while making your selections.

- File name
- Date the file was created (or last edited)
- Time the file was created (or last edited)
- File identification
- File status

The List dialog is common to all file types. The title bar displays the type of file for which you have requested information.



File name

If you select only one file from the **Files** list, the name is copied to this field. If multiple files are selected, the last one selected displays in this field.

Status
Date Range
Files
Directories

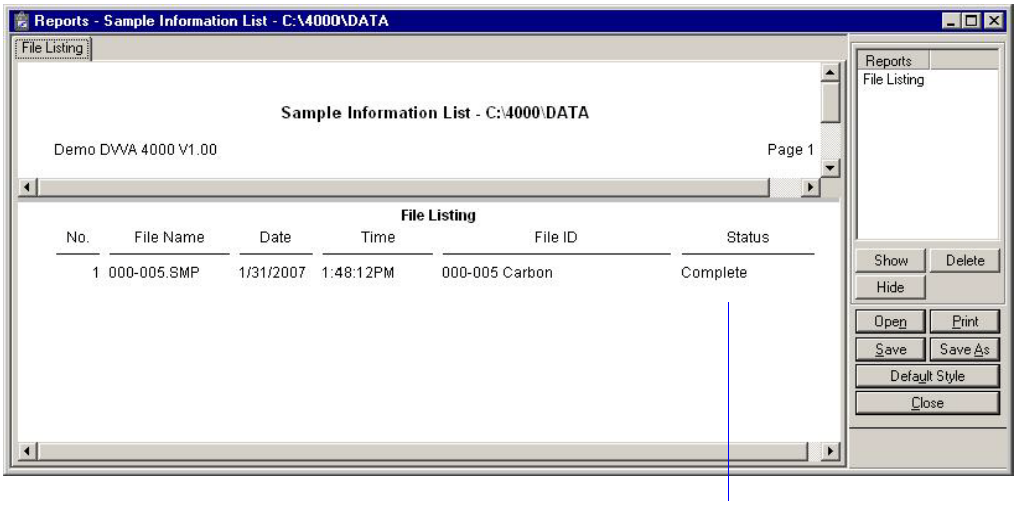
These options are explained in **Selecting Files** beginning on page **2-10**.

Settings

Enables you to choose output options. Select the down-arrow to the right of the **Destination** field to choose the destination:

- **Printer**: enables the **Copies** field allowing you to print up to four copies to a printer.
- **Screen**: prints the information to the computer screen.
- **File**: generates a text file which can be viewed with a text editor or other text file manipulation tool. Also enables the File name field so that you can enter a name for the file (or you can accept the default)

This example shows a sample file sent to the **Screen**.



Refer to **Tool Bar**, page **7-15** for an explanation of the buttons on the tool bar.

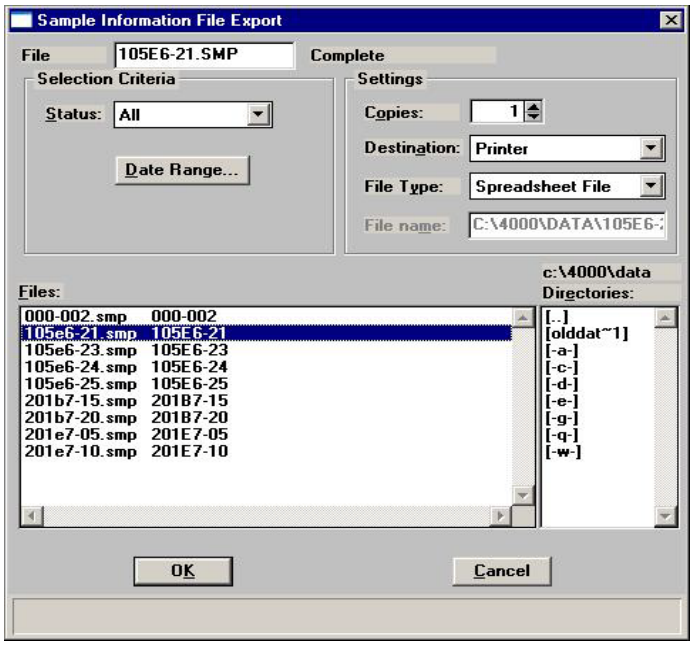
Export

Copies the data in a sample information file and exports it in a text (*.TXT) or spreadsheet (*.XLS) format.

The output file consists of data from the corrected data, blank analysis, and sample analysis.

- Corrected data has four columns: Corrected Height, Corrected Applied Pressure, Corrected Transmitted Pressure, and Corrected Void Volume.
- Data for the blank analysis and the sample analysis are generated in eight columns: Elapsed Time, Height, Applied Force, Transmitted Force, Applied Pressure, Transmitted Pressure, Chamber Temperature, and Ambient Temperature.

Select **File > Export** from the main menu; the Export Sample File dialog is displayed.



File name — Displays the name of the file you select from the **Files** list. You can export multiple files by holding down **Ctrl** while selecting the files.

Status
Date Range
Files
Directories — These options are explained in **Selecting Files** beginning on page 2-10.

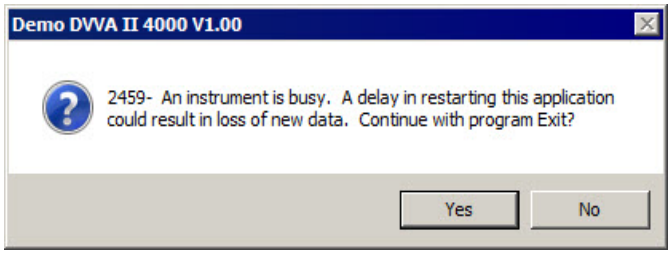
File Type — Enables you to export data as a text file, or in a spreadsheet format.

Copies	Enabled when you choose **Printer** as the destination, allowing you to print up to four copies to a printer.
Destination	Contains a list of output destinations; you can print to a **Printer**, to the **Screen**, or to a **File**.
File name	Enabled when you select **File** as the destination, allowing you to enter a name, or you can accept the default (the sample file name). If you are exporting multiple files, the sample file name is automatically assigned.

Exit

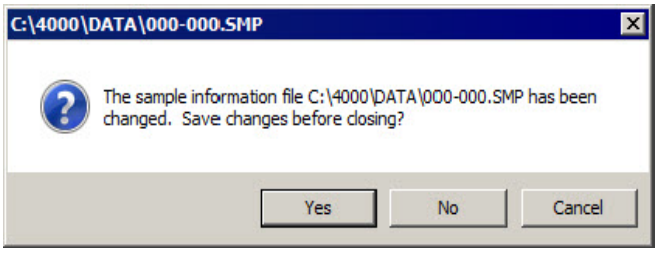
Exits the DVVA II program.

- If an analysis is in progress, the following message is displayed:



Yes exits the analysis program.
No returns allow the analysis to continue.

- If a window containing a modified file is open, the following message is displayed:



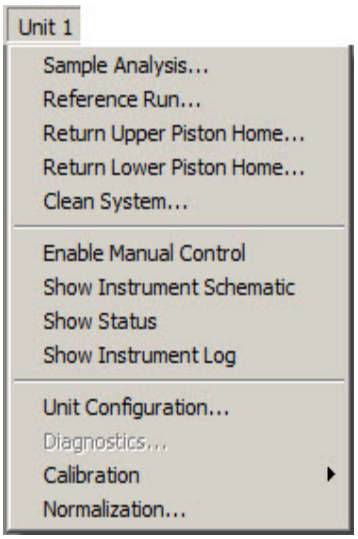
Yes saves the changes and closes the file.
No discards the changes and closes the file.
Cancel returns to the open file.

6. UNIT MENU

The Unit menu contains descriptions of the operations that are performed using the DVVA II analyzer.

The Unit menu does not appear on the menu bar if the analysis program is being used for offline data manipulation.

Description



Sample Analysis Perform a sample analysis. Page **6-3**.

Reference Run Perform an analysis on the SRB reference materials. Page **6-7**.

Return Upper Piston Home Return the upper piston to its home position. Page **6-8**.

Return Lower Piston Home Return the lower piston to its home position. Page **6-8**.

Clean System Clean the sample chamber. Page **6-9**.

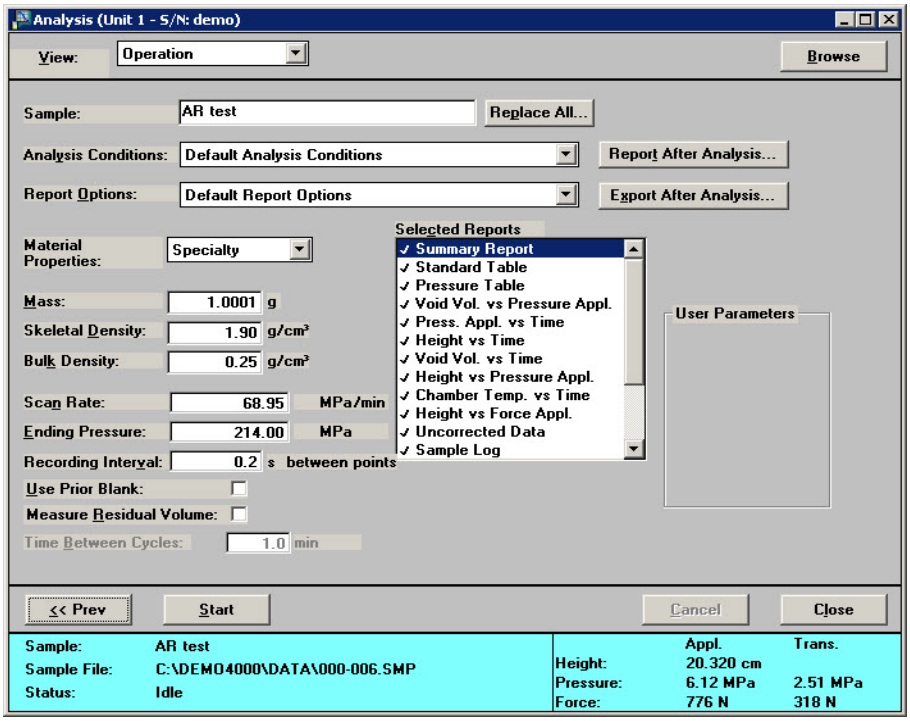
Enable Manual Control	Operate the upper and lower pistons manually. Page **6-8**.
Show Instrument Schematic	Display the instrument schematic. Page **6-12**.
Show Status	Display the status portion of the operational window, enabling you to view the status of the operation in progress. Page **6-13**.
Show Instrument Log	Display the instrument log. Page **6-14**.
Unit Configuration	Display the configuration of the analyzer. Page **6-16**.
Diagnostics	For service personnel only. Page **6-16**.
Calibration	Perform certain instrument calibrations with assistance from a service representative. Page **6-17**.
Normalization	View data from reference runs. Page **6-19**.

Sample Analysis

Use this command to perform an analysis. A blank analysis is part of the analysis procedure and is performed before you add the sample material for analysis. The measured force includes changes in friction caused by the sample type

A blank analysis is performed to correct for this friction. You can skip the blank analysis if you check the **Use Prior Blank** option; the data from the last blank analysis will be used.

Choose a file from the Open Sample Information File dialog, or create a new one, to display the Analysis dialog. The fields now contain the values for the selected file or, if creating a new file, the specified defaults.



View

Allows you to view:

- the current operation
- the instrument schematic; refer to page **6-11** for a description of the components on the schematic
- the instrument log; refer to page **6-14** for a description of the instrument log

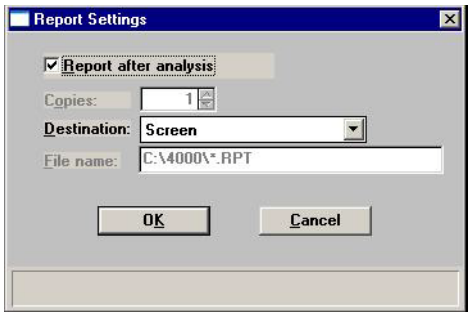
Browse	Allows you to select a different sample file for your analysis, or to create a new one.
Sample	Displays the identification of the sample file.
Material Properties	Defaults to the type of material you selected on the sample information dialog; ensure that it displays the correct type The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated. Choose **Other** only when your material is something other than **Tread/Hard** or **Carcass/Soft**.
Replace All	Enables you to replace the values for all parameters of the current file with those from an existing file.
Analysis Conditions	Displays a description of the analysis conditions file in the selected sample information file. Use the drop-down list to select a different Analysis Conditions file.
Report Options	Displays a description of the report options file in the sample information file you have chosen for this analysis. Use the drop-down list to select a different Report Options file.
Mass **Skeletal Density** **Bulk Density**	Displays the values specified in the current sample information file. These values can be edited if necessary.
Scan Rate **Ending Pressure** **Recording Interval** **Use Prior Blank** **Measure Residual volume** **Time Between Cycles**	Displays the values and options specified in the current Analysis Conditions file; any can be edited for the current analysis. Editing the values on this dialog will not change those of the Analysis Conditions file.

Selected Reports

Displays the reports selected for the current Report Options file; you can edit the selections if you wish. You cannot edit details of the reports.

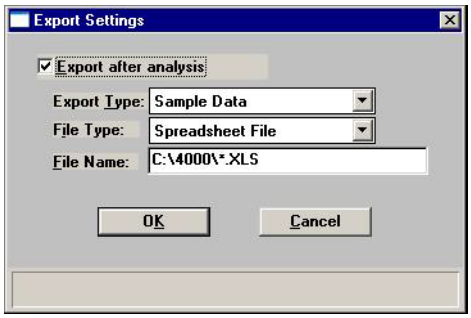
Report After Analysis

Generates a report automatically after the analysis; displays the Reports Settings dialog so that you can specify report output options.



Export after analysis

Exports data automatically after the analysis; displays the Export Settings dialog so that you can specify export output options.



User Parameters

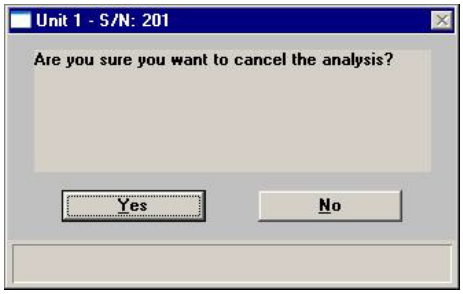
The fields in this group box can be used for SPC (Statistical Process Control) reporting. They are used to specify characteristics of the sample or its manufacturing process, as well as to enter constants to be included in User Model formulae.

Once specified, these parameters display on the sample editor and in the SPC Sample Options dialog.

These fields can also be used to record analysis conditions or sample information so that it can be printed on the Summary report.

Cancel

Enables you to cancel the analysis; a query dialog is displayed.



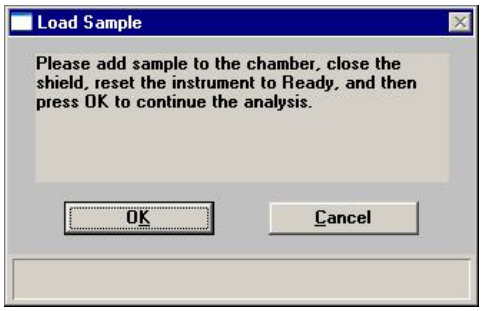
Click **Yes** to cancel the analysis or **No** to continue the analysis.

Prev

Returns you to the Results window of the last analysis performed.

Start

Begins the blank analysis. After completion of the blank analysis, a dialog prompting you to load the sample is displayed. If you chose **Use Prior Blank**, this dialog displays when you select **Start**.



Load the sample, close the shield, press **Reset**, and click **OK** to begin the analysis. Do not click **OK** until you have loaded the sample and closed the shield.

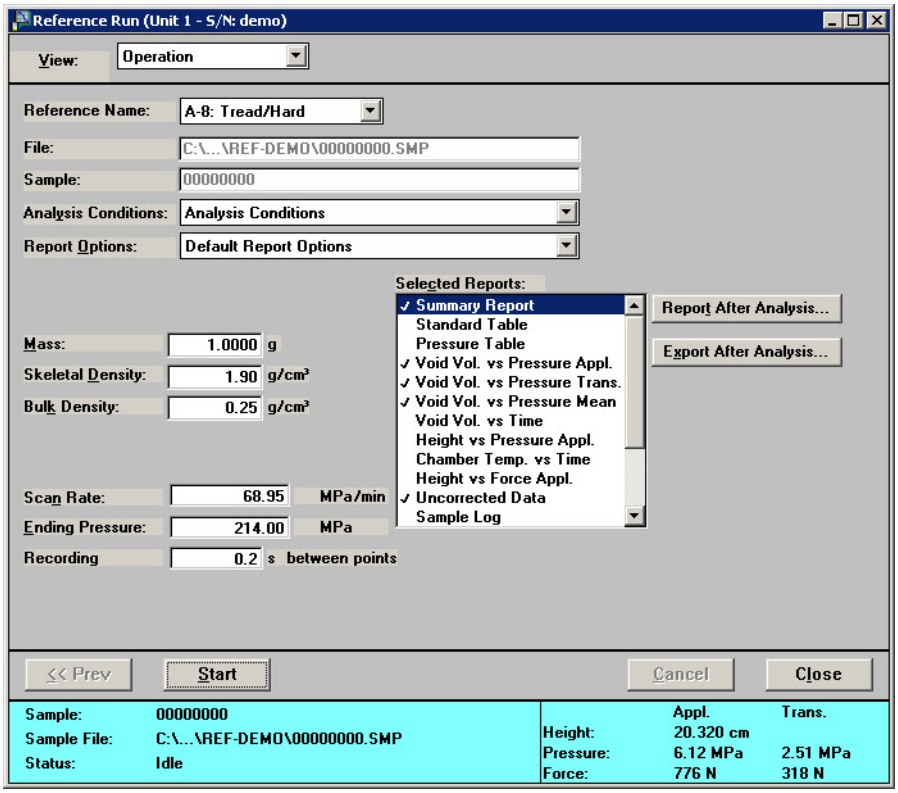
Reference Run

Use this command to perform analyses on SRB series reference materials. These reference runs should be performed:

- on a regular basis to compensate for wear on the piston tip. Perform two reference runs on each reference material *monthly*; or, one run on each reference material *twice a month*. This will consist of 12 runs; two each on the six reference materials.
- when you install a new piston tip. Perform four reference runs on each reference material; this will consist of 24 runs.

At the end of each reference run, the Reference Run dialog is displayed allowing you to choose the appropriate reference material and start the next run.

Data from the runs can be viewed using the **Normalization** option (refer to **Normalization**, page **6-19**).



Reference Name

This drop-down list contains the SRB reference materials defined in the Reference Defaults table (see **Reference Table**, page **8-14**).

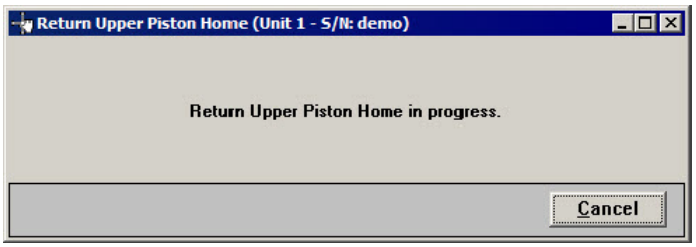
Click the down-arrow and choose the reference material you are using in the analysis.

File	Displays the sample file number; numbers are assigned automatically to reference runs.
Sample	Displays the description assigned to the reference run. By default, this is the SRB series reference material name that was selected in the Reference Name drop-down list for this reference run; e.g., A-8, B-8, C-8.
Bulk density	Enter the bulk density of the carbon black reference material you are using (refer to Appendix C, page **C-1**.)

Refer to **Sample Analysis**, page **6-3** for a description of the remaining fields on this dialog.

Return Upper Piston Home

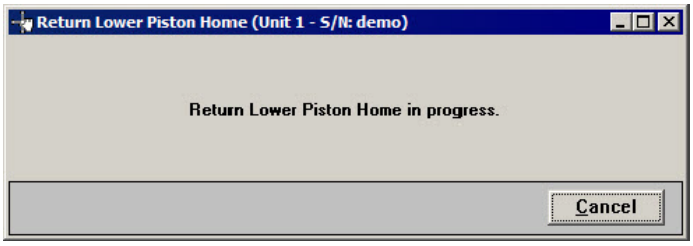
Returns the upper piston to its home position; the Return Upper Piston Home dialog is displayed.



The dialog closes automatically when the upper piston reaches its destination.

Return Lower Piston Home

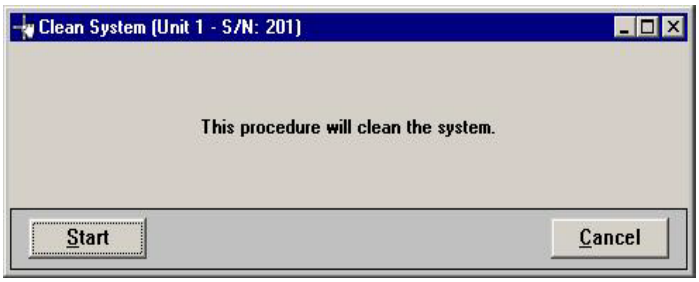
Returns the lower piston to its home position; the Return Lower Piston Home dialog is displayed.



The dialog closes automatically when the lower piston reaches its destination.

Clean System

Cleans residual sample from the inner walls of the sample chamber; the Clean System dialog is displayed.



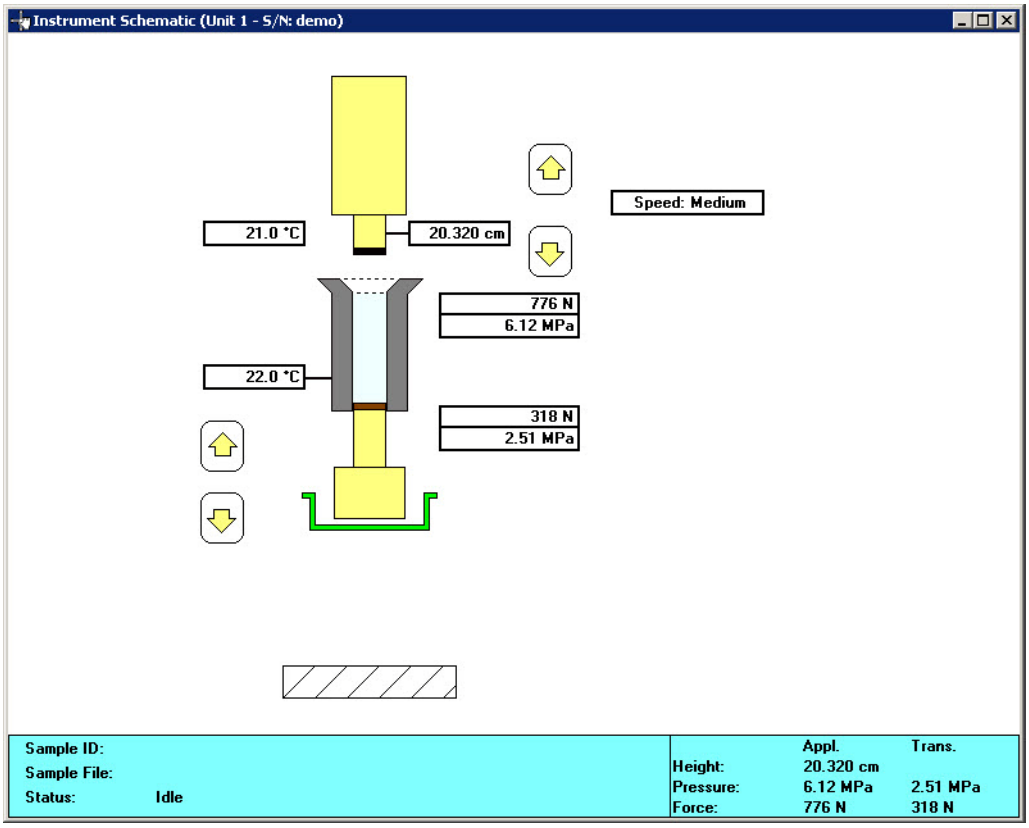
1. Wipe off the upper piston tip.
2. Remove the sample tray and insert the waste tray.
3. Press the **Reset** button on the instrument's front panel.
4. Click **Start** on the Clean System dialog.
5. When the cleaning process is complete, all components return to a ready state and the dialog closes automatically.
6. Remove the waste try and empty its contents.
7. Wipe off the lower piston tip.
8. Insert the sample tray.
9. Press the **Reset** button on the instrument's front panel.

Start	Starts the cleaning process. The piston travels down the sample chamber, removing any residual sample as it travels.
Cancel	Cancels the operation; all components return to a ready state.

Enable Manual Control

Select this option to manually control the pistons. If the instrument schematic is not displayed, select **Unit > Show Instrument Schematic**.

Manual Control is disabled when an automatic operation is in progress.



The movement of the pistons is activated while the appropriate direction symbol is pressed with the left mouse button; movement ceases when you release the mouse button.

Use one of the following options to move to the selectable components on the instrument schematic:

- click on the component
- use the **Tab** key or arrow keys to move to the component

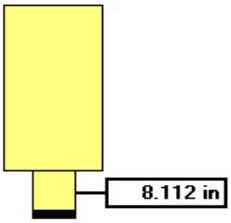
A component is selected when it is surrounded by a dotted line.

Components on the instrument schematic are:

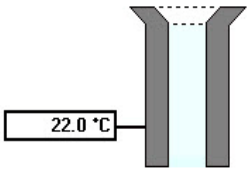
Enable you to move the pistons up and down. The piston's position is indicated on the schematic as you press and hold down the arrow with the left mouse button.

A **Red** state exists for the:

- Upper and lower piston controls when lower piston tray is not in position
- Upper piston descent when the lower piston is not in the fully up or fully down position



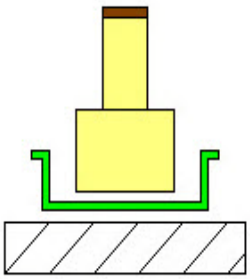
Represents the upper piston. The *distance* from the upper piston to the lower piston is displayed to the right of the piston icon. Use the Up/Down arrows (on the right side) to move the piston when manual control is enabled.



Chamber temperature

Represents the sample chamber.

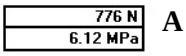
The ambient temperature of the sample compartment (upper) and the temperature of the sample chamber (lower) are displayed to the left of the chamber.



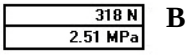
Represents the lower piston and tray, indicating it is in position.

If the tray is not positioned at this level, a message displays on the schematic indicating it is not in position. The upper and lower piston controls will also be disabled (shown in red).

Use the Up/Down arrows (on the left side) to move the piston when manual control is enabled.



A

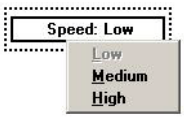


B

These readings display to the right of the sample chamber.

A. The applied force and pressure at which the upper piston presses against the lower piston.

B. The transmitted force and pressure received by the lower piston.



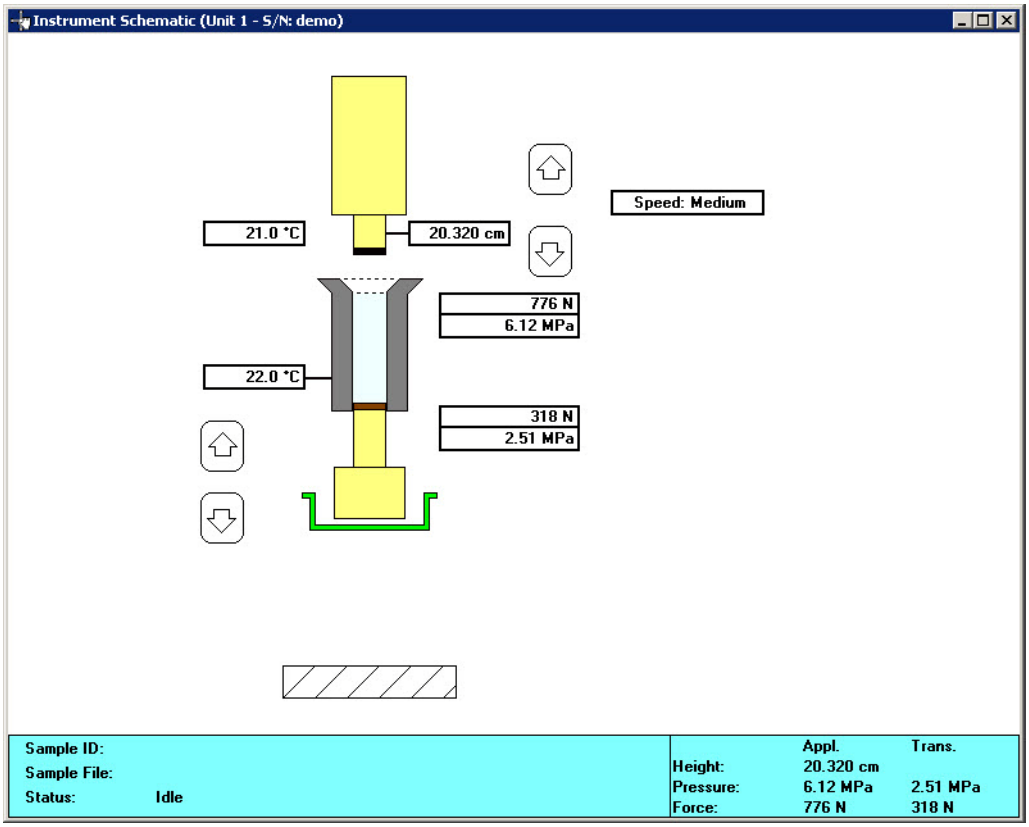
Displays the speed at which the upper piston travels. Right-click on the icon to display its shortcut menu, or press **Shift + F9** when the icon is selected.

Actions: *Low, Medium, High*

Show Instrument Schematic

Select this option to display a schematic of the DVVAII 4000.

Refer to page **6-10** for a description of the components on the instrument schematic.



Show Status

Select this option to show only the status portion of the operational window.

Sample ID Displays the identification of the current sample file.

Sample File Displays the name of the current sample file.

Status Displays the status of the current operation, or Idle if an operation is not in progress.

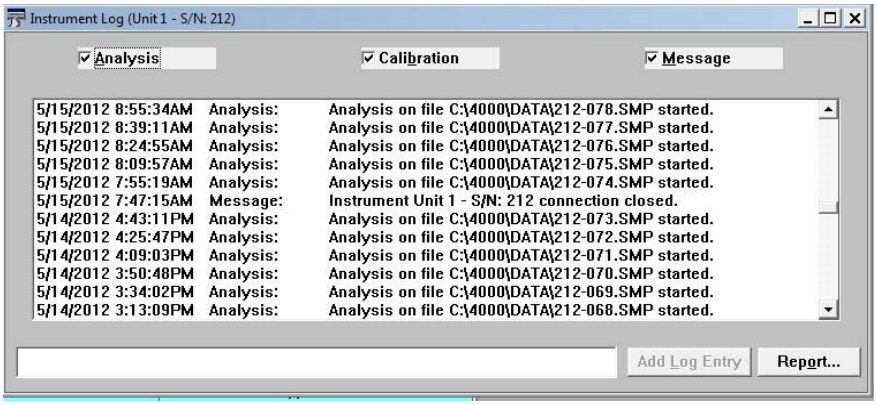
Height Displays the distance from the tip of the upper piston to the tip of the lower piston.

Pressure Displays the applied and transmitted pressures being applied by the piston.

Force Displays the applied and transmitted forces being applied to the piston.

Show Instrument Log

Select this option to display a log of recent analyses, calibrations, and errors or messages. This information is recorded automatically by the software. By default, information for analyses and messages are retained 60 days, and calibration information for 90 days. You may change the time for which this information is retained in the [Unit 1] section of the WIN4000.INI file.



Analysis
Calibration
Message

Select the type of entries to display in the instrument log. For example, if you select **Analysis**, only Analysis operations are displayed.

Add Log Entry

Use this push button to enter analysis and/or sample criteria (not recorded automatically by the analysis program) that you wish to display in the Instrument Log report. You can make multiple entries by selecting this push button as many times as you wish.

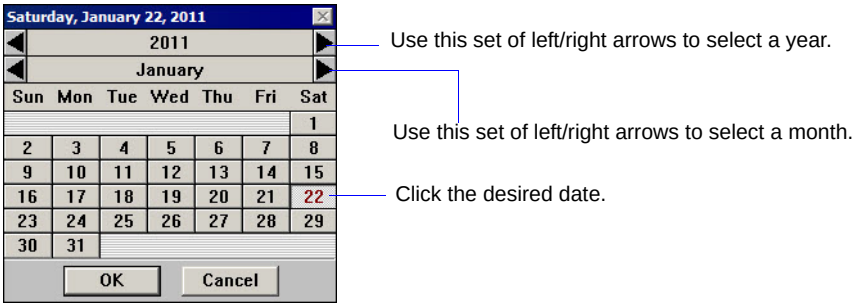
Report

Enables you to print or display on the screen a report of log entries; the Log Report Settings dialog is displayed.

Start Date

Use this field to specify a date at which to begin listing entries. Be sure the cursor is in the **Start Date** field and use one of the following methods to specify a date:

- Type the desired date; you do not have to enter a slash (/).
- Double-click in the field (or press **F4**) to display a calendar to choose a date.



- Press **F3** to insert the current date.

Copies

Enabled when you choose **Printer** for the destination, allowing you to print up to four copies.

Destination

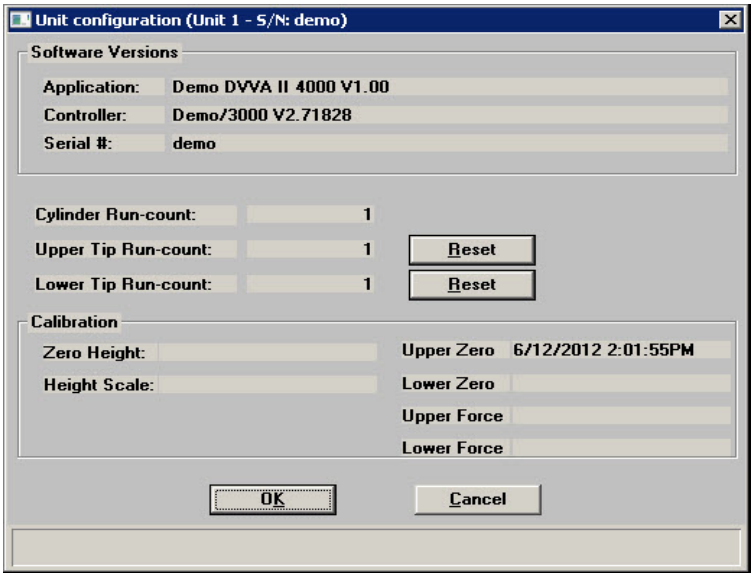
Specify a report destination; you can print to the Screen, Printer, or a File.

File name

Enabled when you select **File** for the destination, enter a file name.

Unit Configuration

Select this option to display software/hardware configurations for the selected analyzer. When you select **Unit > Unit Configuration**, the Unit Configuration dialog is displayed.



Software Versions — Displays the software versions for components being used by the analyzer, and the serial number of the analyzer.

Cylinder run-count — Displays the number of piston cycles for the analyzer

Upper Tip Run-count
Lower Tip Run-count — Displays the number of cycles for the upper and lower pistons.

Reset — Enables you to reset the **Tip run-count** fields to zero after the piston tip is replaced.

Calibration — Shows the date and time for current instrument calibrations.

Diagnostics

This command is used by Micromeritics service personnel.

Calibration

The DVVA II 4000 is calibrated before it leaves the factory; calibration values and dates are displayed on the Unit Configuration dialog (accessed from the Unit menu).

All but one calibration listed on this drop-down menu can be enabled and performed only with the assistance of a trained Micromeritics service representative using the Service Test Mode (refer to **Service Test Mode**, page **8-20**).

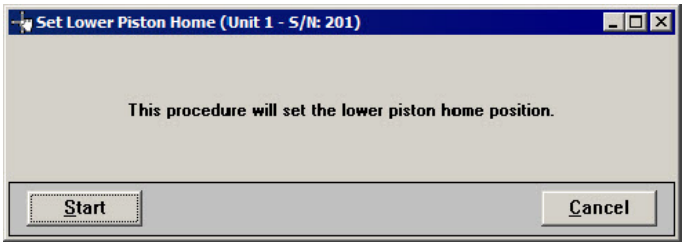
Each dialog has the following push buttons:

Start — Starts the calibration procedure.

Cancel — Cancels the procedure; all components return to a ready state.

Set Lower Piston Home

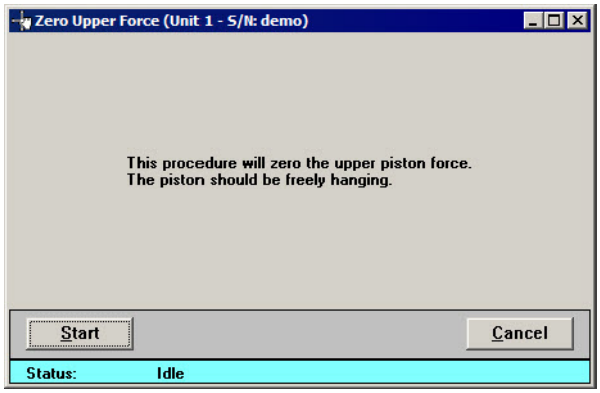
Zeroes and sets the position of the lower piston, the Set Lower Piston Home dialog is displayed.



If the Master switch on the rear panel is turned off, the position of the lower piston is reset (indicated on the instrument schematic). Use this command to establish the home position before operating the analyzer.

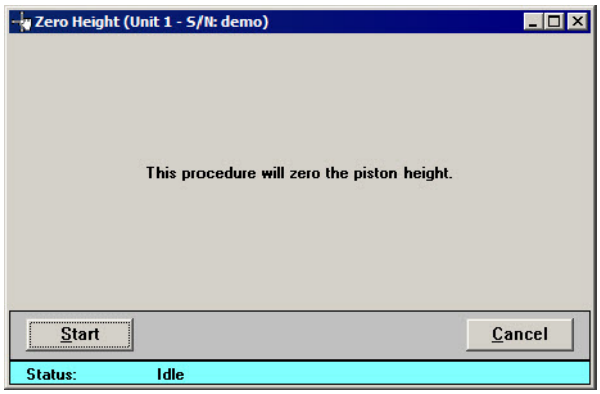
Upper Zero Force

Zeroes the force of the upper piston. Be sure the upper piston is raised to its uppermost position before beginning.



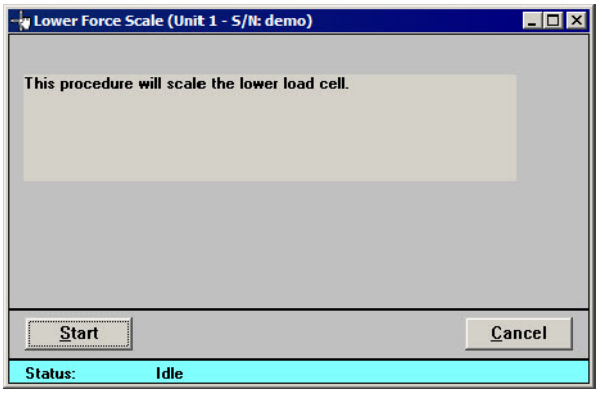
Zero Height

Zeroes the piston height.



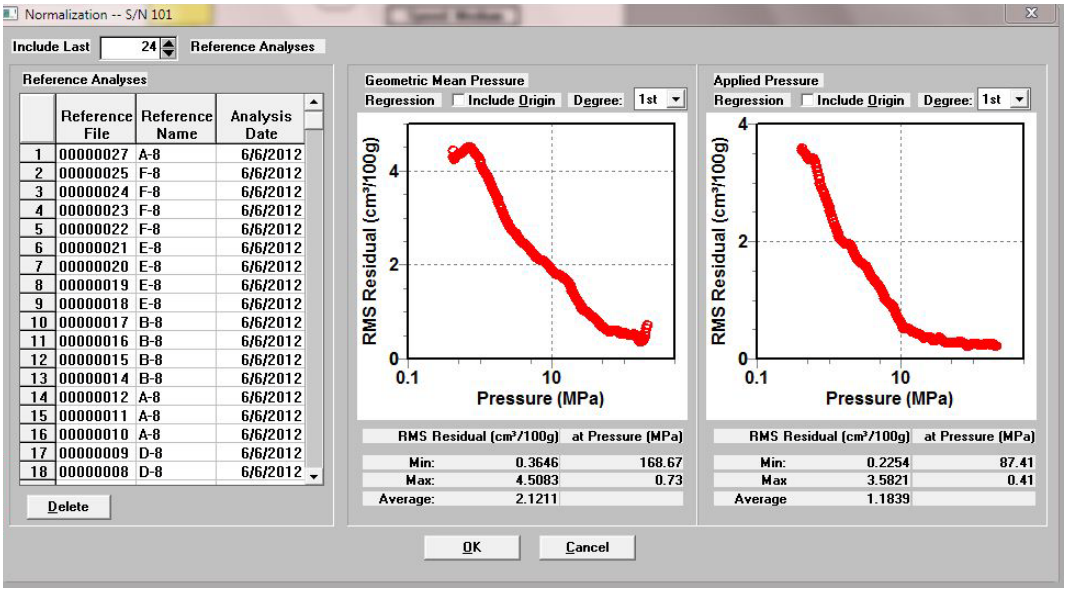
Lower Force Scale

Scales the lower load cell reading.



Normalization

This option enables you to view detailed reference run data. The current reference sample analyses are compared to the original "master" reference analysis averages to determine by how much the current analysis has shifted from that average. The normalization routine calculates a set of polynomials to correct for that difference. What is shown in the Normalization window (see example below) is how well the software was able to determine the polynomials it will use to correct, or normalize, the collected data.



Include Last — Choose the number of recent reference analyses you wish to include in the normalization.

Reference Analyses table — Lists details of the files chosen in the **Include Last** field.

Data graphs — Displays the Regression fit residuals for the Geometric Mean and Applied Pressure in the respective window.

Regression — Determines how the Normalization regression is calculated.

Include Origin — Include the origin (0) in the calculation.

Degree — Displays the degree of normalization.

7. REPORTS MENU

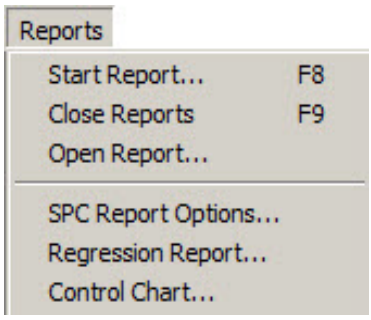
The commands on the Reports menu enable you to:

- start, close, and open reports
- specify SPC report options
- generate SPC reports

This chapter also provides information on the tools available for customizing and manipulating onscreen reports

Reports can be generated for data collected on a sample that has completed analysis, or on one that is currently being analyzed (includes only data collected up to the time of the report).

Description



Listed below are brief descriptions of the commands contained on the Reports menu. Detailed descriptions are in subsequent sections.

Start Report — Generate a report on a completed sample analysis or on the data collected thus far for an analysis in progress. Page 7-2.

Close Reports — Close all open report windows. Page 7-4.

Open Report — Open a report that was saved from the report window. Page 7-4.

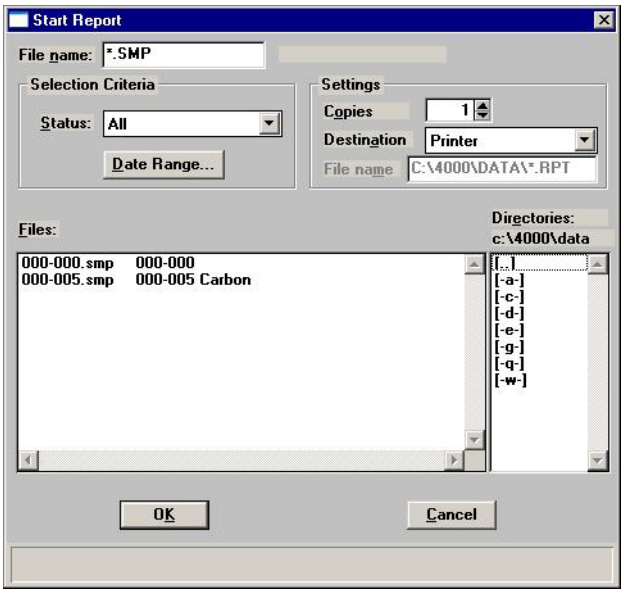
SPC Report Options — Specify sample data to include in SPC reports. Page 7-5.

Regression Report — Generate a regression report. Page 7-6.

Control Chart — Generate a control chart report. Page 7-9.

Start Report

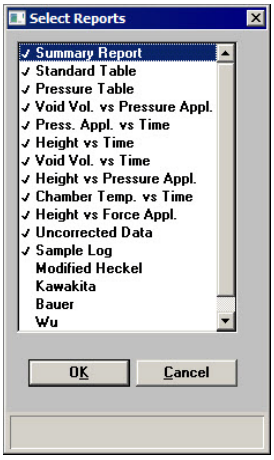
Select this option to generate a report on a sample analysis; the Start Report dialog is displayed.



File name

Displays the name of the sample file you select from the **Files** list window. If you have a sample file open, its name defaults to this field.

- If you select multiple files, the reports specified in each sample file are printed to the output destination.
- If you choose a single file, the Select Reports dialog containing the available reports is displayed. This dialog allows you to select the reports you wish to generate.



Status

This drop-down list determines the type of sample files that display in the **Files** list window, and within the date range. Refer to **Table 2-2. File Status and Description**, page **2-11** for a definition of the status types.

Date Range

Displays the Select Dates dialog so that you may specify a range of dates. Refer to **Selecting Files**, page **2-10** for a description of this push button.

Copies

Enabled when the **Printer** destination is chosen, allowing you to print up to four copies of the selected report(s).

Destination

Displays a drop-down list of output destinations:

Printer: reports are generated to your default printer.

Screen: reports are displayed onscreen

File: tabular reports are converted to a text file which can be viewed with a text editor or other text file manipulation tool.

File name

Enabled when you select **File** as the destination. Allows you to enter a name, or you may accept the default.

Files list window

Displays a list of the available sample files for the choice shown in the **Status** field and within the range of dates specified in the **Select Dates** dialog.

Directories

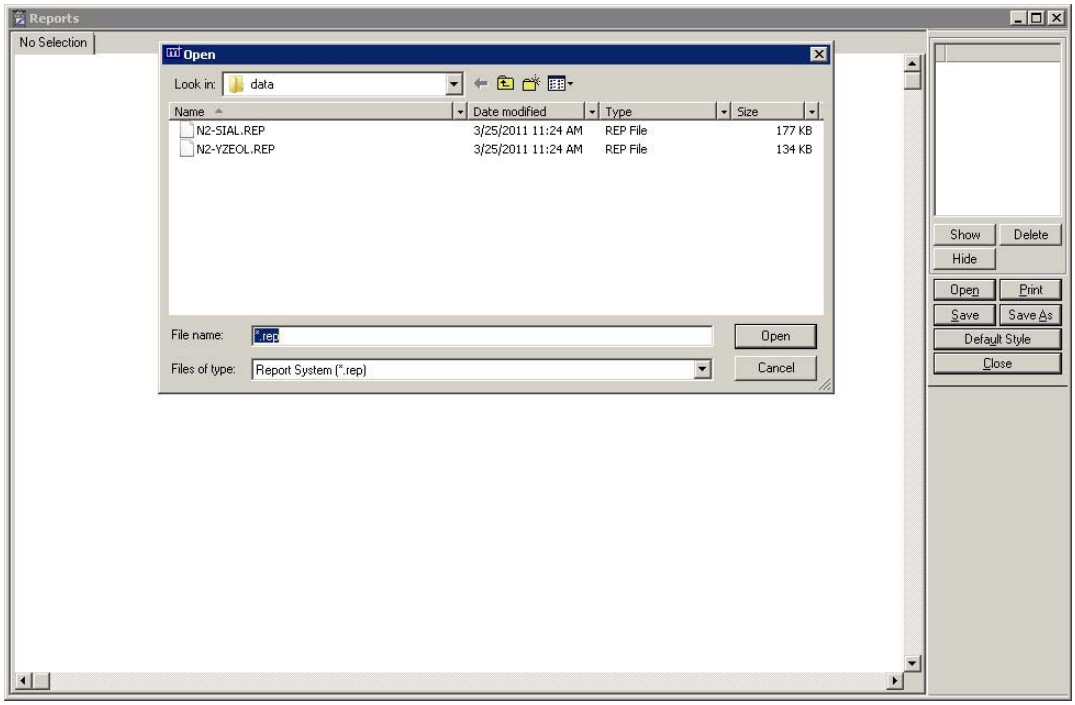
Displays a list of available drives and directories. The drive and directory last accessed is displayed immediately above the **Directories** list window. Refer to page **2-12** for information on navigating to other directories.

Close Reports

This option enables you to close all open report windows at one time. This avoids having to select **Close** on each report window. This option is unavailable if reports are being generated.

Open Report

This option enables you to open a report that was saved from the Report window; the Report window opens with an Open dialog positioned on top.

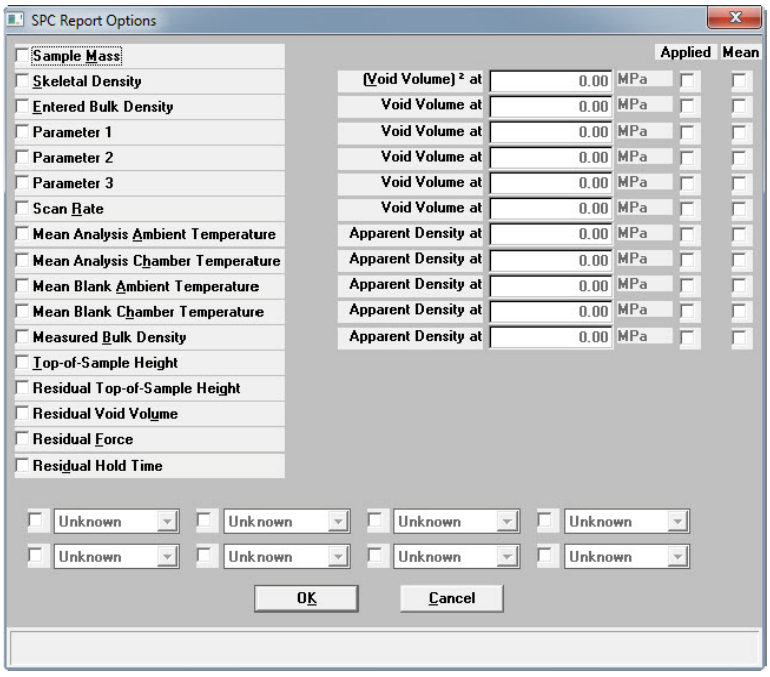


Navigate to the desired directory, select your file, and click **Open**; your saved report is displayed in the Report window.

SPC Report Options

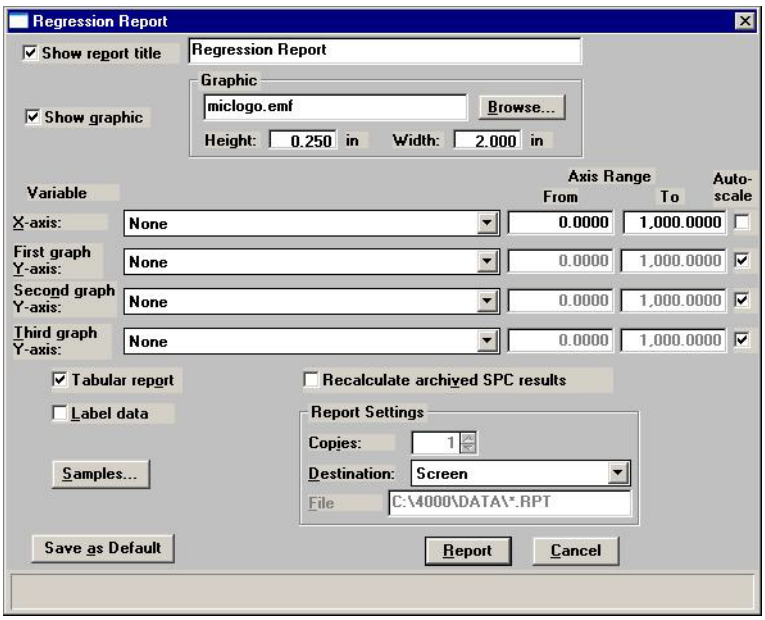
The SPC Report Options dialog lists the variables available for SPC reporting. You can check as many as you wish; however, for efficiency, it is best to select only the variables you actually intend to use. All variables selected must be computed for *each* sample file used in an SPC report.

If you select an option that requires an entry, the adjacent field is enabled allowing you to enter a value.



Regression Report

The regression report is used to determine the interdependency between two variables. Up to three dependent variables (Y-axis) may be plotted against a single independent variable (X-axis). The degree of correlation between the variables also is reported.



Show report title

Select this option to have a title display on your report. You can enter up to 40 alphanumeric characters.

Show graphic

Displays a graphic above the report title. For example, you may wish to display your company logo. The graphic must be a bitmap (bmp) or enhanced metafile (emf).

Click **Browse** to choose the file; use the **Height** and **Width** fields to specify a size. This image can be edited or removed in the report window if printed to the screen.

X- and Y-Axes Variable fields

Allows you to designate the X- and Y-axes variables. Click on the down arrow to display a list of variables. The variables in this list are the ones you specified in the **SPC report options**.

With this option, you can plot the regression of up to three Y-axis variables against the X-axis variable. The X-axis specifies the independent variable for the regression, while the Y-axes provide the dependent variables.

Axis Range Specify the beginning and ending values for the X- and Y-axis ranges. Data collected outside these ranges are not included in the plot. These fields are disabled if you choose **Autoscale**.

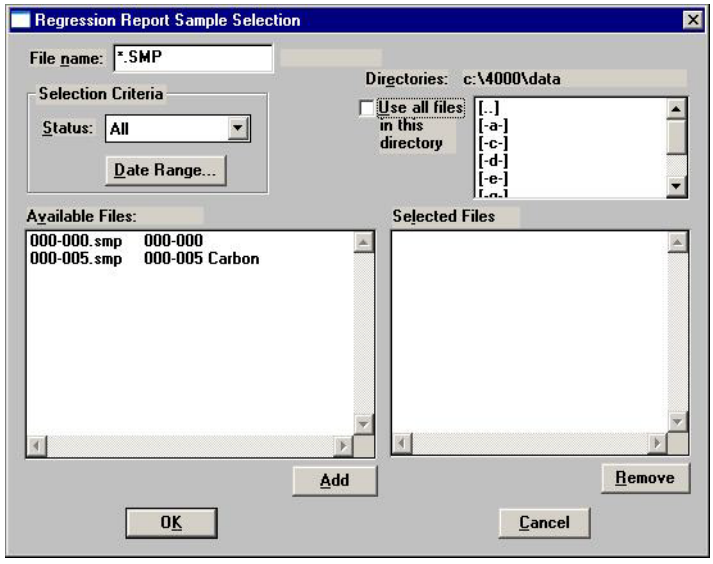
Autoscale Scales the X- and/or Y-axis automatically.

Recalculate archived SPC results Select this option to have archived SPC values recalculated. This ensures that any changes made to the SPC Report Options are included in the new report; however, it does lengthen the time required to generate the report.

Tabular report Generate tabular, as well as graphical, data of the included samples. A tabular report contains the numeric values contributed by each sample.

Label data Allows you to label the points on the plot to correspond with the values in the sample files.

Samples Displays the Regression Report Sample Selection dialog, so you can choose the sample files to be reported.

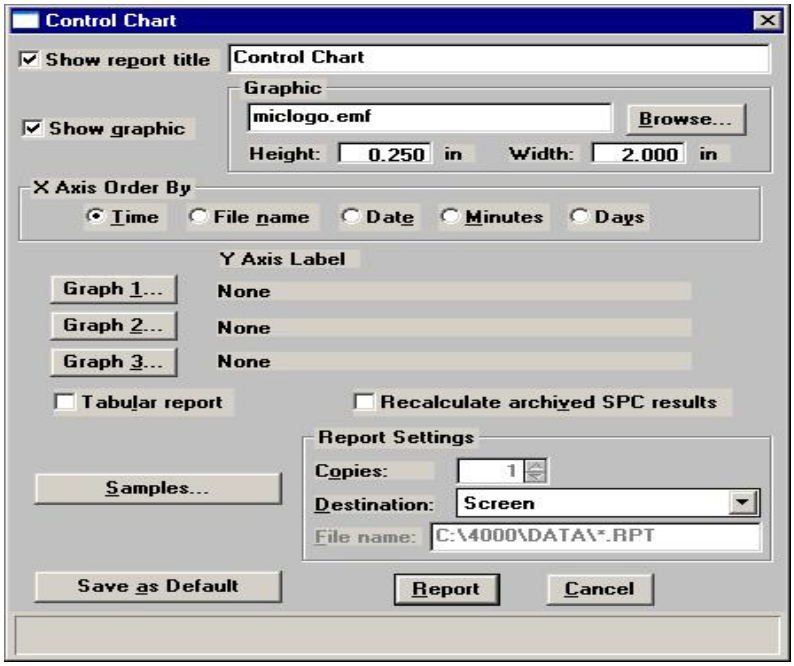


File name Use this field to limit the files displayed in the Available Files pane. For example; enter **g*.smp** to display only the files beginning with a **g**.

Status	Determines the type of sample files that display in the **Available Files** pane in the selected directory for all dates, or within the specified range of dates. Refer to **Table 2-2. File Status and Description**, page **2-11** for an explanation of the Status types.
Date Range	Displays the Select Dates dialog so that you can specify a range of dates. Refer to **Selecting Files**, page **2-10** for an explanation of this push button.
Use all files in this directory	Includes all files in the selected directory (listed in the Available Files window) in the report.
Directories	Lists the current directory. Use the directory window to navigate to a different directory. Refer to **Selecting Files**, page **2-12** for information on selecting different directories.
Add	Moves the selected file in the **Available Files** pane to the **Selected Files** pane. Alternatively, you can simply double-click on the desired files. You can select multiple files by holding down **Ctrl** while making your selections. You can include up to 200 sample files.
Remove	Removes the selected file from the **Selected Files** pane and places it back into the **Available Files** pane.
Save As Default	Saves the current definition of the report as the default.
Report Settings	The options in this group box enable you to choose output criteria. The **Copies** field is enabled when you choose **Printer** as the destination, enabling you to print up to four copies of the report.
Report	Generates the report.

Control Chart

This option enables you to generate a control chart report which plots the changes in a statistic.



Show report title

Select this option to include a title on your report. You can enter up to 40 alphanumeric characters.

Show graphic

Displays a graphic above the report title. For example, you may wish to display your company logo. The graphic must be a bit-map (bmp) or enhanced metafile (emf).

Click **Browse** to choose the file, then use the **Height** and **Width** fields to specify a size. This image can be edited or removed in the report window.

X-axis Order By

Enables you to choose the order in which X-axis statistics are placed.

Time places the files on the graph at numerical points in the order of the date/time the files are analyzed.

File name places the files on the graph at numerical points in alphanumeric order.

X-axis Order By (*continued*)

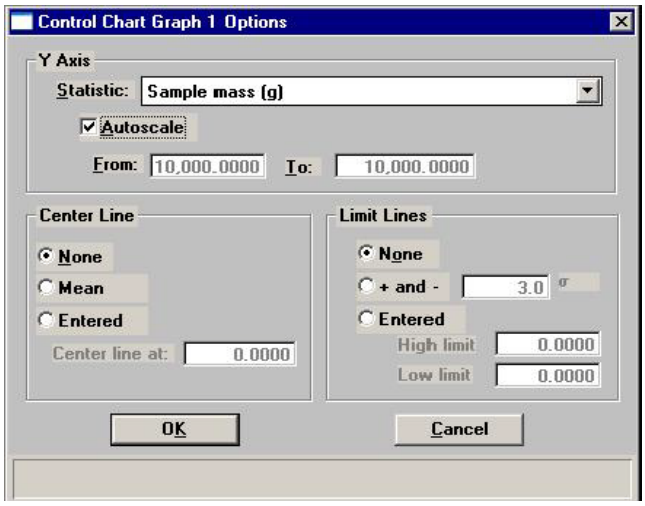
Date places the files on the graph at points representing the actual date/time the files are analyzed.

Minutes places the files on the graph at points representing the minutes that have elapsed from the first file placed on the list, which is the earliest-analyzed file.

Days places the files on the graph at points representing the number of days that have elapsed from the first file placed on the list, which the earliest-analyzed file.

Graph [n]

Displays the Control Chart Graph [n] Options dialog, allowing you to define the Y-axis of each graph.



Statistic

This drop-down list displays the SPC variables selected on the SPC Report Options dialog. The variable you choose will be plotted against the variable chosen for the X-axis.

Autoscale

Scales the Y-axis scaled automatically. If you wish to specify a range, deselect this option and enter a range in the **From** and **To** fields.

Center Line

Displays placement options for the variable's optional value. Choose *Entered* to specify placement of the line.

Limit Lines

Displays the options available for limiting lines. You can have the lines placed at some multiple of the standard deviation or at specified positions (*Entered*).

When you select *Entered*, the **High limit** and **Low limit** fields are enabled, allowing you to enter appropriate values.

Tabular report

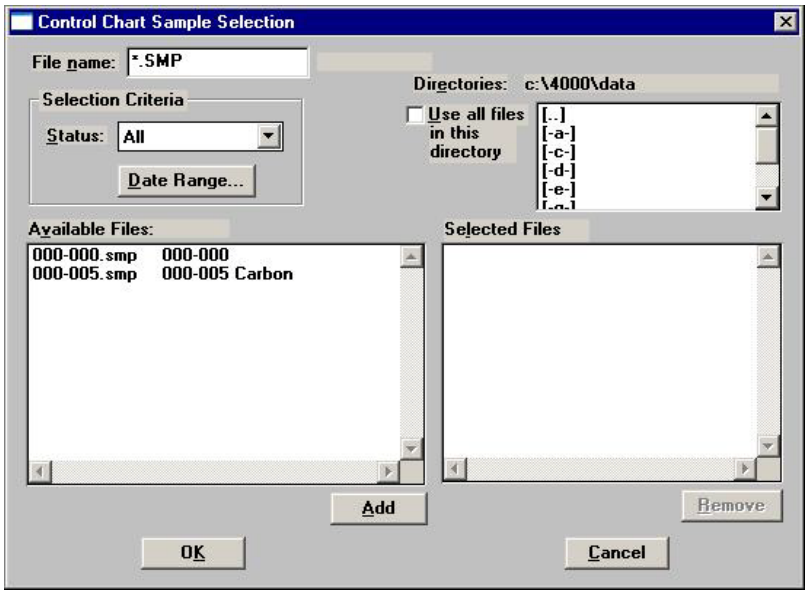
Generates tabular, as well as graphical, data of the included samples. A tabular report contains the numeric values contributed by each sample.

Recalculate archived SPC results

Select this option to have archived SPC values recalculated. This ensures that any changes made to the SPC Report Options are included in the new report. It also lengthens the time required to generate the report.

Samples

Displays the Control Chart Sample Selection dialog, for you to choose the sample files to report.



This dialog functions in the same manner as the Regression Report Sample Selection Dialog explained earlier in this chapter. Refer to page 7-6 if you need assistance on the fields of this dialog.

Save as Default	Saves the current definition of the report as the default.
Report Settings	The options in this group box enable you to choose output criteria. The **Copies** field is enabled when you choose **Printer** as the destination, enabling you to print up to four copies of the report.
Report	Generates the report.

Printed Reports

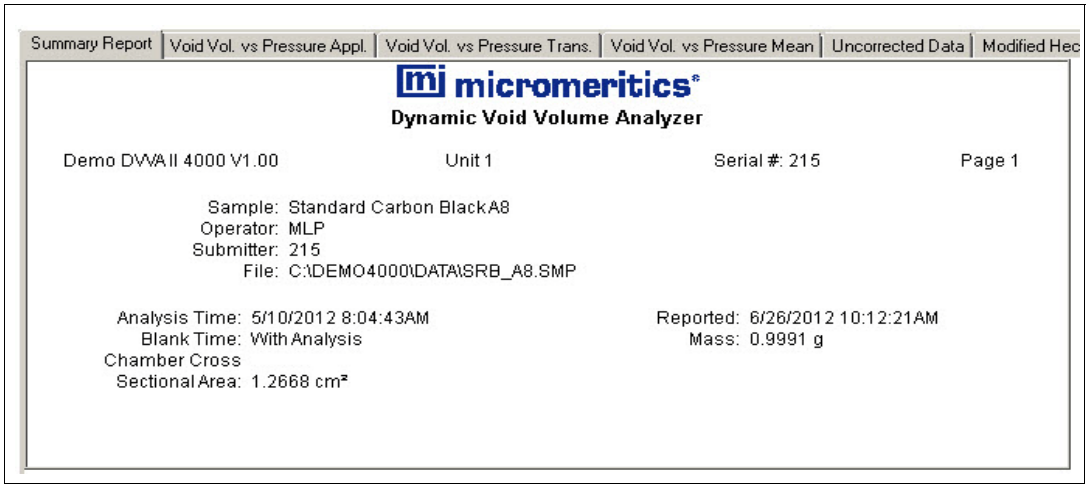
Header

All reports contain a header displaying file statistics, such as sample information, instrument serial number, date and time of analysis, analysis conditions, and so forth. Headers also contain notes of any changes to the sample file that occur after analysis.

Summary reports also contain parameters for the blank analysis when requested.

Compaction reports also contain the calculated parameters of the applicable equation as well as the RMS error.

This example shows a typical report header.

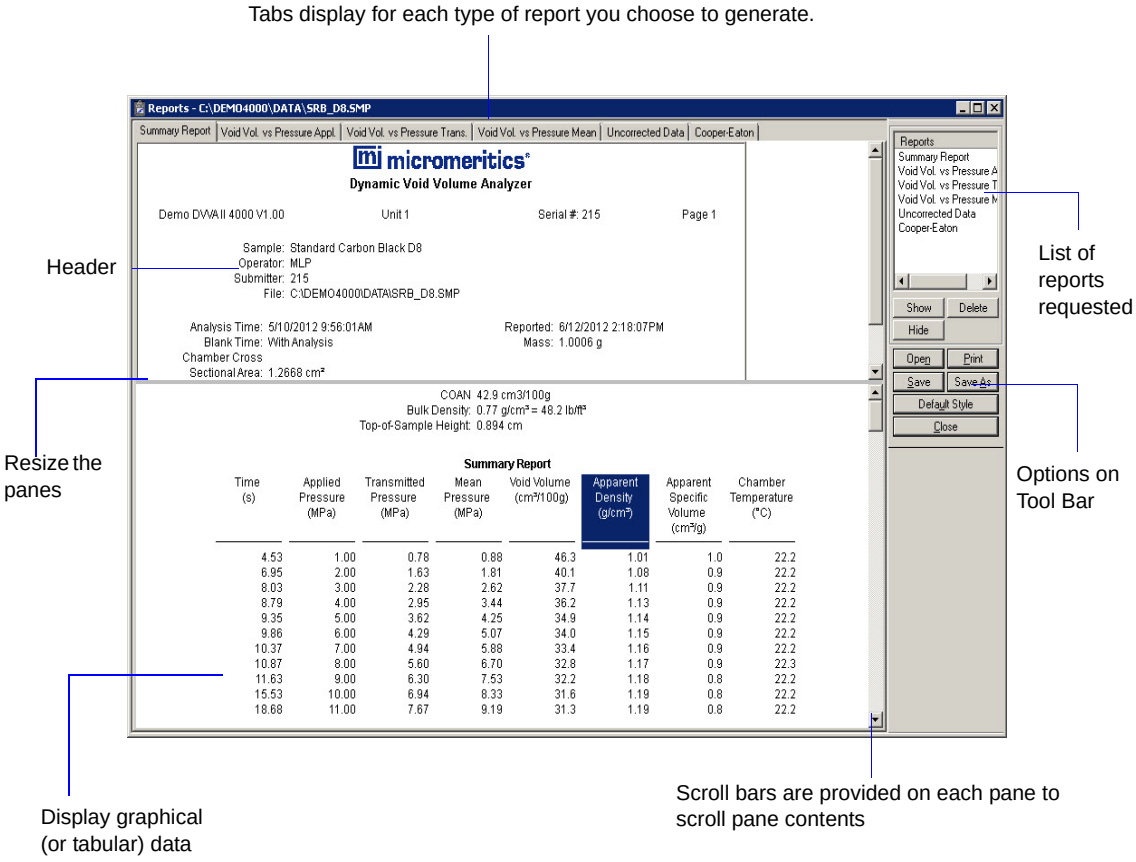


Onscreen Reports

The report window containing onscreen reports provides many options for customizing and manipulating reports:

- a tool bar, page **7-15**
- shortcut menus, page **7-18**
- zoom feature, page **7-22**
- axis cross hairs, page **7-23**

Reports printed to the screen are displayed in a window like the one shown below. Each requested report is listed in the Reports window on the tool bar; they are also indicated by selectable tabs across the top of the report header. To view a specific report, select its tab or select the report in the Reports window and click **Show**.



You can resize the header pane or the data pane using the double arrow obtained when placing your cursor at the bottom of the bar separating the two panes. This allows you to “hide” the header if desired.

Scroll bars are provided on both panes for scrolling through pane contents.

You can double-click on a report in the list to display the contents of that report.

Tool Bar

Reports Contains a list of all requested reports.

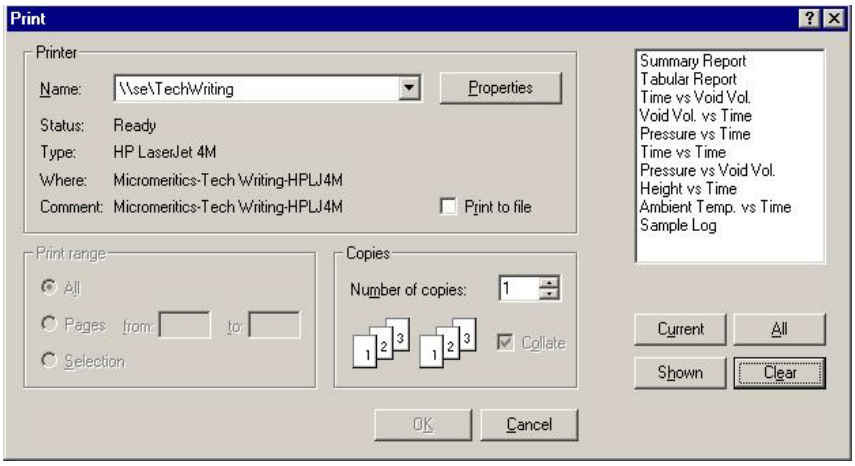
Show Shows the selected report in the report window. If the report has been hidden, it and its associated tab will become visible.

Delete Deletes the selected report. The deleted report(s) will have to be regenerated if deleted in error.

Hide Hides (removes) the selected report from the report window. The report's associated tab is also removed.

Open Opens a previously saved report file.

Print Displays a print dialog so that you can choose a printer for report output. A list of available reports is displayed in the window on the right side of the dialog.



For convenience in selecting the reports to print, push buttons are provided beneath the report window. Or, you can make your selection by clicking on the desired reports.

Current prints the report displayed in the report window.

Shown prints only the shown reports; any nonhighlighted reports indicate they are hidden. You can still select hidden reports from this window to print.

All prints all reports, including those that may have been hidden.

Clear clears all selections.

Save

Saves all reports of the currently open file in a report format using the same name as the sample file, only with an **rep** extension. If you wish to specify a name and/or specific reports to save, use the **Save As** push button.

Save As

Saves all or specified reports from the currently open file. The push buttons displayed on this dialog perform in the same manner as the print dialog (explained above).

Reports can be saved in three different formats:

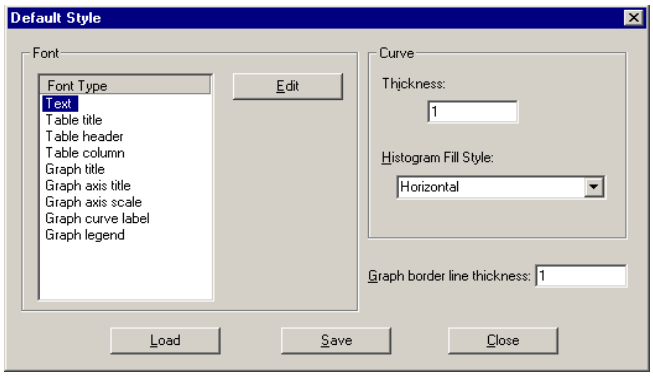
Report system (*.rep): Saved in a format which allows you to open the file using the push button on the Report window tool bar, or from the **Reports** > **Open Report** command.

Spreadsheet (*.xls): Saved in a format which can be imported into most spreadsheet programs.

Ascii Text (*.txt): Saved in ASCII text which can be imported into programs accepting this type of file.

Default Style

Displays the Default Style dialog so that you can specify default parameters for report fonts and curve properties.



Font

Contains a list of report elements for which the font can be edited. Highlight the element and click **Edit** to specify font attributes.

Curve

Specify a thickness for report curves.

Graph border line thickness

Specify a thickness for the border of the graph.

Load

Load the last saved defaults.

Save	Saves the changes as the defaults. If you do not click **Save**, the changes apply to the current report set only. The next reports revert to the defaults.
Close	Closes the Default Style dialog and applies the changes. If you clicked **Save**, the changes become the defaults. If you did not click **Save**, the changes apply only to the current report set.
Close	Closes the report window.

Shortcut Menus

Shortcut menus are accessed when you right-click on the tabular or graphical portion of a report.

Tabular Reports

Resize column	Specify the width of the selected column (in inches).
Rename column	Edit the name of the selected column. Use **Ctrl + Enter** to insert line feeds.
Move column	Move the location of the selected column to the left or to the right.
Align column	Enables you to right-align, left-align, or center the data in the selected column.

Hide column Displays a list of all columns that are not hidden, enabling you to select the one you wish to hide.

Show column Displays a list of hidden columns, enabling you to have them shown again.

Column font Change font attributes for the tabular data in the current report.

Header font Change font attributes for column headers in the current report.

Edit title Edit the table title and font.

Copy table as text Copy the entire table (column headers and data) and insert it into another program. Columns are tab-delimited, allowing easy alignment.

Graphs

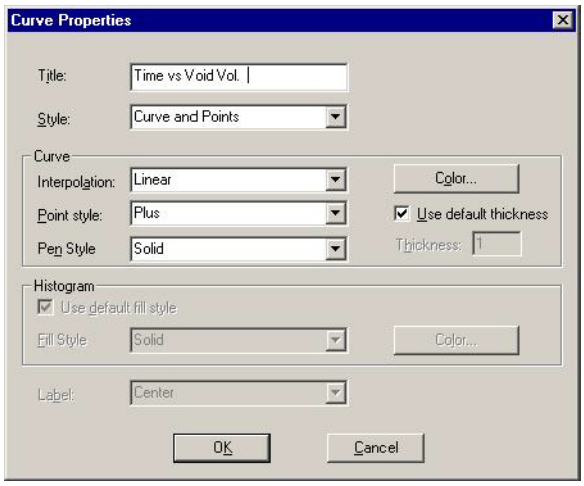
Autoscale Autoscales all axes of the graph. This function is useful for returning to a full view after zooming.

Redraw Sets axis boundaries to its original view. You can also use this function to remove cross-hairs.

Show curve Show a hidden curve. This option is disabled (greyed) if no curves have been hidden.

Hide curve Hides a curve.

Edit curve Allows you to edit curve properties.



Title Displays the title of the curve you are editing.

Style Drop-down list containing styles in which collected data can be displayed.

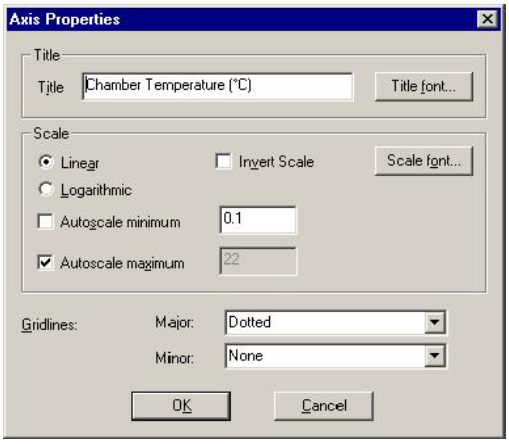
Choices: Curve, Histogram, Points, Curve and Points

Curve group box Edit the curve interpolation, the style of curve and/or points, and the pen color. The options in this group box are disabled if Histogram is chosen in the **Style** drop-down list.

Histogram group box Allows you to specify the type of fill and the color if Histogram is chosen as the style for collected data.

Edit axis

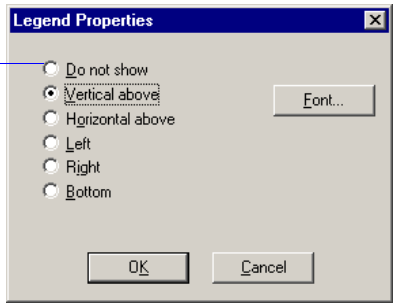
Displays the Axis Properties dialog, allowing you to edit axis properties.



Edit legend

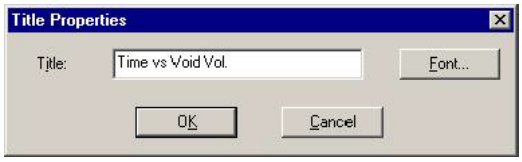
Displays the Legend Properties dialog, allowing you to edit the placement of the legend.

Select this option to remove the legend.



Edit title

Displays the Title Properties dialog, allowing you to edit the current graph's title and font.



Copy as metafile

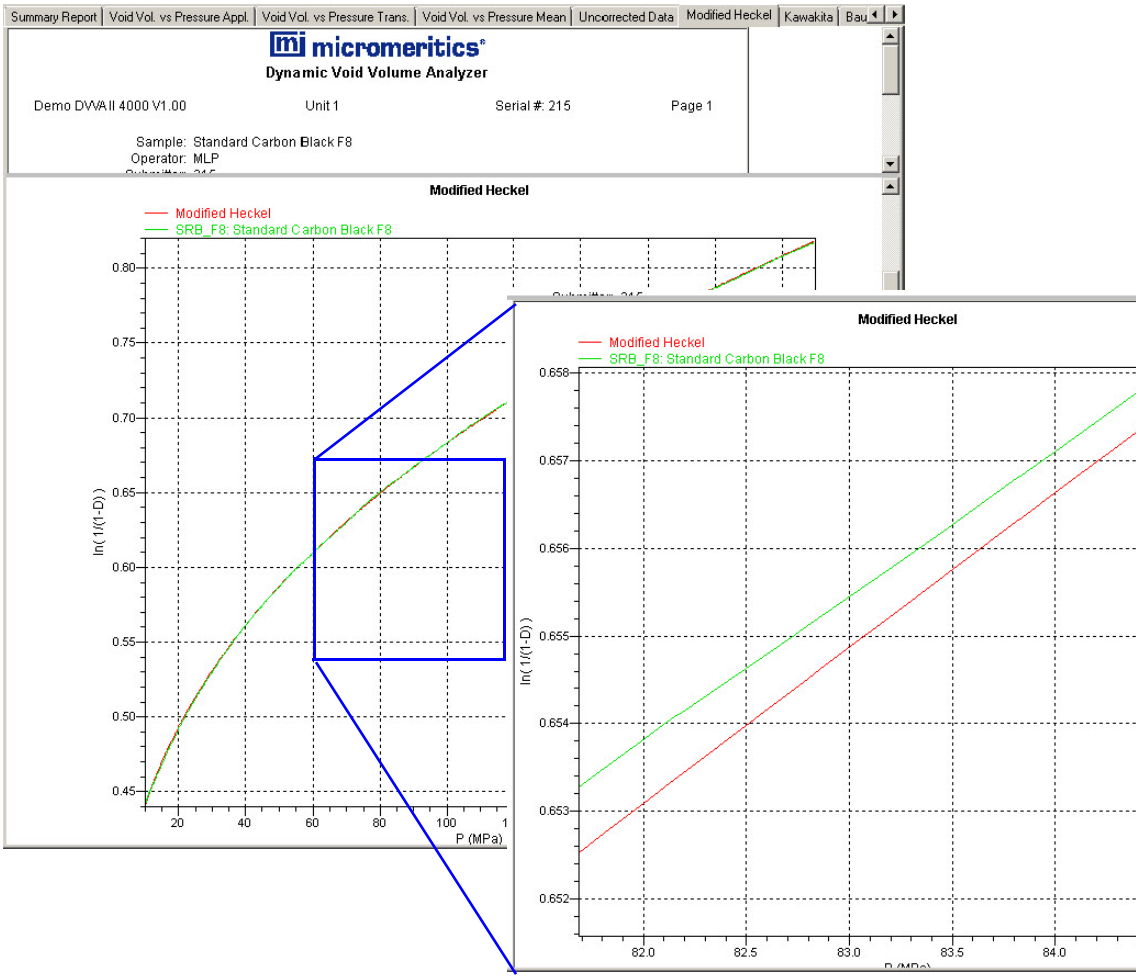
Copies the graph and places it on the clipboard, allowing you to paste it into other applications accepting Windows metafiles.

Copy as text

Copies the data used to generate the graph as a series of tab-delimited columns of text.

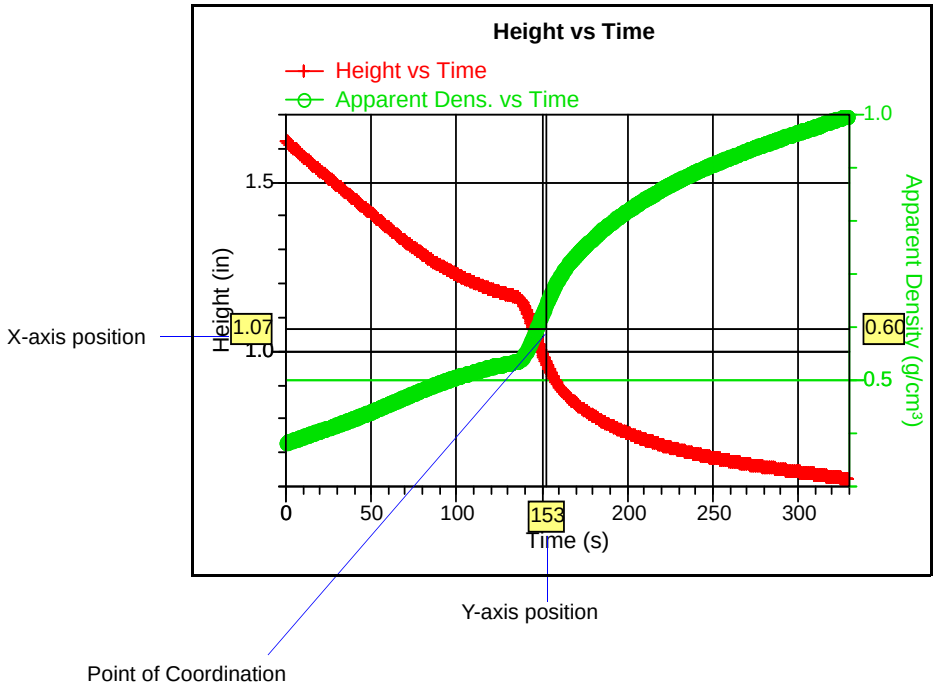
Zoom Feature

A zoom feature is included with the report system so that you can zoom in to examine fine details. To use this feature, hold down the left mouse button and drag the mouse cursor (drawing a box) across the area you wish to view; then release the button. The enlarged area immediately fills the graph area. Right-click in the graph area and choose **Redraw** or **Autoscale** from the shortcut menu to return to the normal view.



Axis Cross Hair

A cross-hair function is available so that you can view axis coordinates. To use this feature, simply left-click in the desired area of the graph.



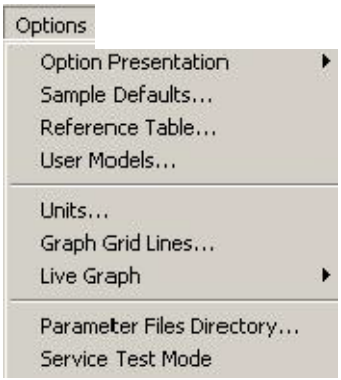
Right-click in the graph area and choose **Redraw** or **Autoscale** from the shortcut menu to remove cross-hair lines and return to the normal view. Alternatively, you can click outside of the graph area.

8. OPTIONS MENU

The Options menu contains commands that allow you to configure the system to your laboratory's requirements, and to access service tests. With the options on this menu, you can:

- Choose between basic, advanced, or restricted mode
- Edit program defaults
- Specify data presentation modes
- Specify a directory for predefined parameter files
- Access the service test mode to perform calibrations

Description



Option Presentation — Allows you to display the sample file dialog in Advanced, Basic, or Restricted format. Page **8-3**.

Sample Defaults — Specify defaults for the parameters contained in the sample information and parameter files. Page **8-6**.

Reference Table — Specifies the void volume range for SRB (Standard Reference Black) reference materials for the carbon industry. Page **8-14**.

User Models — Enables you to enter calculated parameters, such as alternate COAN, from void volume curves based on your own experimentation. Page **8-15**.

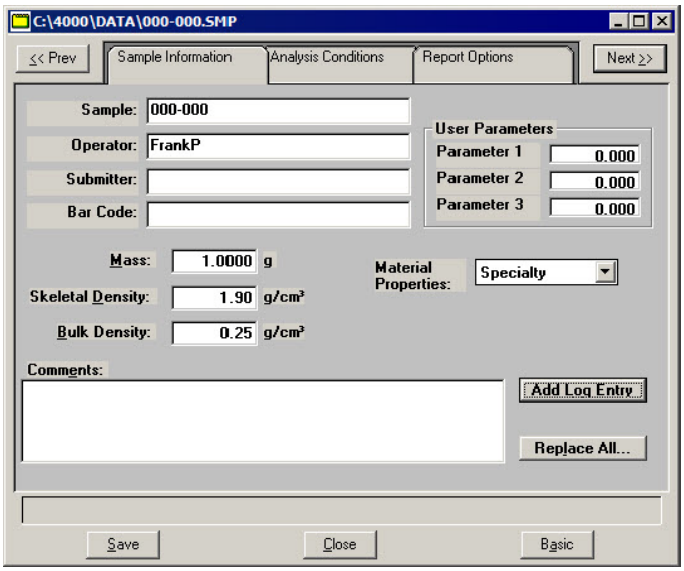
Units	Choose the types of units to use for measurement, pressure, and temperature. Page **8-14**.
Graph Grid Lines	Choose the types of grid lines to display for the X- and Y-axes. Page **8-14**.
Live Graph	Choose the variable for the X-axis during data collection. Page **8-19**.
Parameter Files Directory	Specify a different location for the predefined parameter files used by the Basic and Restricted formats. Page **8-20**.
Service Test Mode	Enables you to perform certain troubleshooting procedures. This option is available only under the direction of a Micromeritics service representative. Page **8-20**.

Option Presentation

The sample information dialogs for the DVVA II program can be presented in an Advanced, Basic, or Restricted format.

Advanced

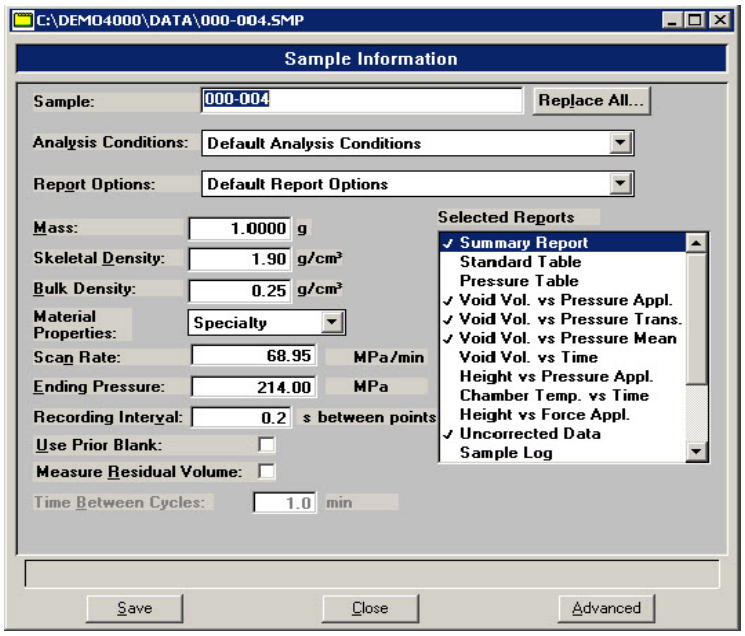
The **Advanced** format presents all parts of the sample information file in a tabbed dialog. Click the tab (or use **Next** and **Prev)** to access the parameters.



The Advanced format is used to create customized sample files. You can also switch to the Basic format, if desired, by clicking **Basic**. Refer to **Advanced**, page **5-4** for a detailed description of this dialog.

Basic

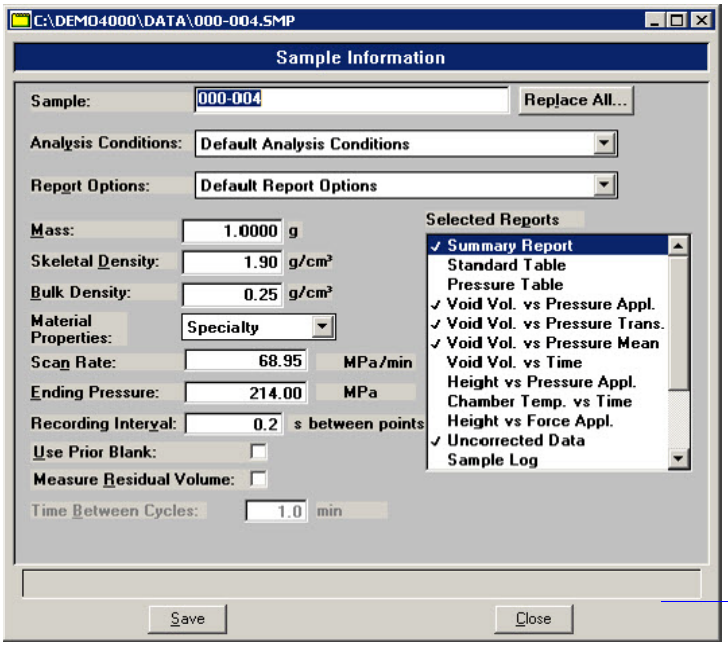
The **Basic** format presents the sample information file and its parameter files in a single dialog.



This format is used to create sample information files using previously defined parameter files. You can easily switch to the Advanced format by clicking **Advanced**. Refer to **Basic**, page **5-7** for a detailed description of this dialog.

Restricted

The **Restricted** format is identical to the Basic format, except that certain menu options are disabled, and you cannot switch to the Advanced format.



Does not contain an Advanced push button allowing access to all parameters of the file.

This format is password-protected and typically is used in laboratories where analysis conditions must remain constant.

When you select Restricted, a dialog requesting a password is displayed:

Any password (up to 31 characters) can be used to enable the Restricted format. The same password must be used to exit the Restricted format. For example, if you enter “password” to enable the Restricted format, then you must use “password” to exit. If you forget the password, open the WIN4000.INI file and navigate to the **Private** section. The current password will be shown immediately following “OptionPresentationPassword.” Make a note of the password, exit the WIN4000.INI file, and enter the password where requested. Do not attempt to delete the password in the WIN4000.INI file.

Sample Defaults

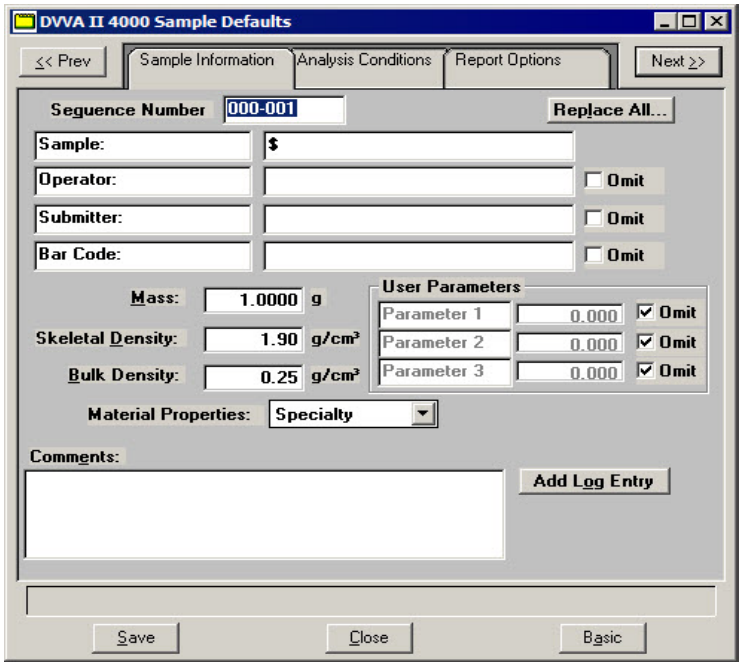
This option allows you to specify default parameters for sample information files. You can specify defaults using the **Advanced** or **Basic** formats only. The defaults specified for the Basic format are used for the Restricted format.

Advanced

The Advanced Sample Defaults dialog contains tabs for each parameter. The values you specify in the parameter portions (Analysis Conditions and Report Options) of the sample file are saved as the defaults for newly created parameter files.

For example, after specifying defaults for a sample file in the Advanced format:

- Select **File > Open > Sample Information**, then click **Yes** to create the file, and the defaults you specify display for all parameters.
- Select **File > Open > Analysis Conditions**, name and create the file, and the defaults you specify in the Analysis Conditions portion of the Advanced Sample Defaults dialog display in the fields.



Sequence

Specify a default sequence for the sample file name. The number you specify is sequenced incrementally each time you create a sample file and is the one that appears in the **File name** field when you select **File > Open > Sample Information**.

- Use numbers, letters, or other printable characters, such as dashes. At least three numbers must be included.
- Use up to eight characters
- The application prohibits using such characters as * or ?

Sample

Enter an additional identification that provides more information than the sample file name alone.

In the field on the left: edit the prompt for **Sample** if desired. For example, you may prefer to use **Test** or **Material**. You can use up to 20 characters.

In the field on the right: specify a format for the sample identification. Or, leave this field blank and enter identifications as files are created.

- Use numbers, letters, or other printable characters, such as dashes
- Use up to 42 characters (including the $ symbol if used)
- Include the automatically generated file name as part of the identification by using the $ symbol where you want the sequence number to appear.

  For example, if the sequence number is 000-001, enter the sample identification as follows:

  Lab #25 - $

  The resulting sample identification for the first sample information file would be:

  Lab #25 - 000-001

  and the second:

  Lab #25 - 000-002, and so on.

Operator
Submitter

Enter the name (or other identification) of the operator performing the analysis and the name of the person, department, customer, etc. that submitted the sample for analysis.

The fields on the left can be edited to display something other than **Operator** and **Submitter** if desired. You can use up to 20 characters in each field.

The fields on the right are used to specify default names or titles, or leave them blank and enter names when the files are created.

- Include the automatically generated file name (number) by using the symbol $ where you want the sequence number to appear. Refer to the example given above.
- Use up to 42 characters (including the $ symbol)
- Select **Omit** to prevent this item from displaying on the sample file dialog

Bar Code

This field enables you to enter bar code information. If bar code information is not used, you can use this field to enter additional information about the sample; for example, you may wish to enter the lot number of your sample.

This field, as well as other fields on the dialog, accepts data from a bar code reader. A bar code reader can be attached to one of the USB connectors on the computer. Simply scan the bar code and the number transfers to the highlighted field.

Range: 40 alphanumeric characters

The label for this field may be customized to display differently or omitted from displaying at all using the options available in **Sample Defaults**, page **8-6**.

Mass

Enter a default value for the sample's mass; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.

Skeletal Density

Enter the skeletal density (also known as the true density) of your most commonly analyzed sample.

Bulk Density

Enter the bulk density of your most commonly analyzed sample.

User Parameters

The fields in this group box can be used for SPC (Statistical Process Control) reporting. They are used to specify characteristics of the sample or its manufacturing process, as well as to enter constants to be included in User Model formulae.

Once specified, these parameters display on the sample editor and in the SPC Sample Options dialog.

These fields can also be used to record analysis conditions or sample information so that it can be printed on the Summary report.

Select **Omit** to prevent them from displaying on the sample information dialog.

Material Properties

Enter the type of sample material you are analyzing.The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated.

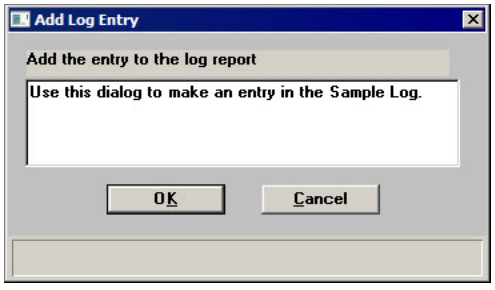
Choose **Other** only when your material is something other than **Tread/Hard** or **Carcass/Soft**.

Comments

Enter comments about the sample or its analysis conditions. Comments entered here are printed in the header of the reports.

Add Log Entry

Displays the Add Log Entry dialog, enabling you to enter comments about the sample or its analysis conditions.



Anything you enter using this option appears in the Sample Log; it does not display in the report header.

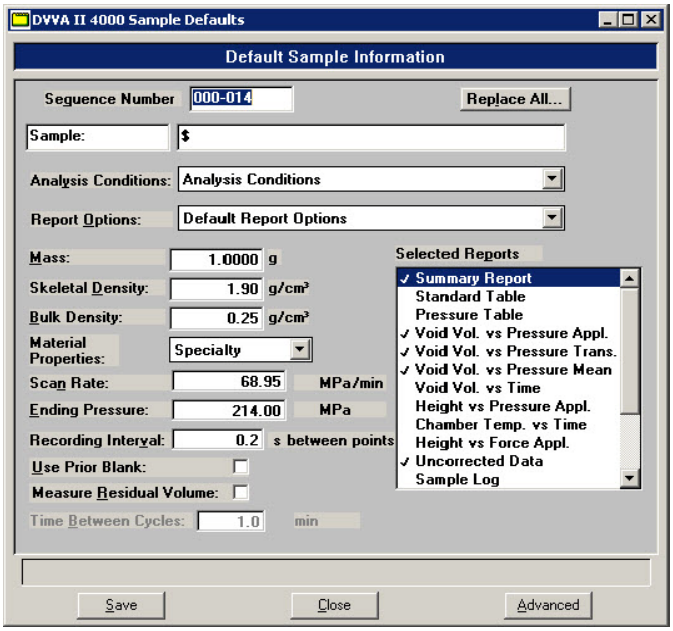
Replace All Replace the contents of all parameters in the current default sample file with those from an existing sample file. For example, you may have an existing sample file that contains the parameters that you wish to use for defaults.

Click on each remaining tab of the Advanced Sample dialog to establish parameter defaults. Refer to the sections indicated below if you need assistance on the fields of the dialogs.

- **Analysis Conditions**, page **5-10**
- **Report Options**, page **5-12**

Basic

The dialog for the Basic format contains all parameters on one screen.



The defaults you specify for the Basic format also serve as the defaults for the Restricted format.

Sequence

Specify a default sequence for the sample file name. The number you specify is sequenced incrementally each time you create a sample file. It is the number that appears in the **File name** field when you select **File > Open > Sample Information**.

- Use numbers, letters, or other printable characters, such as dashes. At least three numbers must be included
- Use up to eight characters
- The application prohibits using such characters as * or ?

Replace All

Replace the contents of all parameters in the current default sample file with those from an existing sample file. For example, you may have an existing sample file that contains the parameters that you wish to use for defaults.

Sample

Enter an additional identification that provides more information than the sample file name alone.

In the field on the left, edit the prompt if desired. For example, you may prefer to use **Test** or **Material**. The maximum number of characters is 20.

In the field on the right, specify a format for the sample identification.

- Use numbers, letters, or other printable characters, such as dashes.
- Use up to 42 characters (including the $ symbol if used)
- Include the automatically generated file name as part of the identification by using the $ symbol where you want the sequence number to appear.

  For example, if the sequence number is 000-001, enter the sample identification as follows:

  Lab #25 - $

  The resulting sample identification for the first sample information file would be:

  Lab #25 - 000-001

  and the second:

  Lab #25 - 000-002, and so on.

Analysis Conditions
Report Options

Each parameter has a drop-down list containing predefined parameter files (some were included with the software). Choose the file you wish to use as the default.

Mass

Enter a default value for the sample mass; 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) is the recommended amount of sample to use.

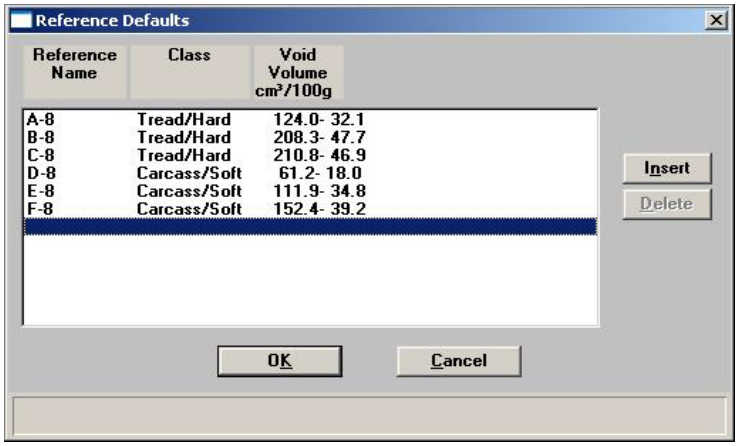
Skeletal Density

Enter the skeletal density (also known as the true density) of your most commonly analyzed sample.

Bulk Density	Enter the bulk density of your most commonly analyzed sample.
Material Properties	Choose the type of sample material you are analyzing. The Material type is used to determine which carbon property models are used for this particular carbon. For example, a different equation is used to predict COAN for Tread/Hard carbons than for Carcass/Soft carbons. If you select **Other**, the COAN is not calculated. Choose **Other** only when your material is something other than **Tread/Hard** or **Carcass/Soft**.
Scan Rate **Ending Pressure** **Recording** **Use Prior Blank** **Measure Residual Volume** **Time Between Cycles**	Displays the values and options specified in the Analysis Conditions file you choose for the default.
Selected Reports	Displays the reports selected in the Report Options file you choose for the default.
Save	Saves the specified defaults.
Close	Closes the dialog.

Reference Table

This table lists the void volume range for SRB (Standard Reference Black) reference materials for the carbon industry.

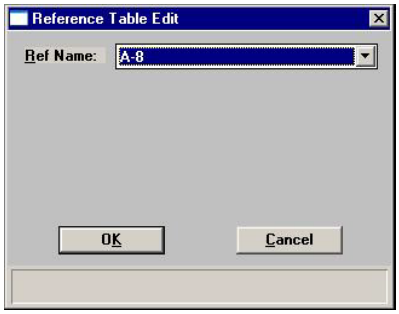


Reference Name Contains the SRB reference number or name.

Class Indicates the type of reference material; **Tread/Hard** or **Carcass/Soft**.

Void Volume Displays the void volume range.

Insert Allows you to add reference materials to the list of defaults.

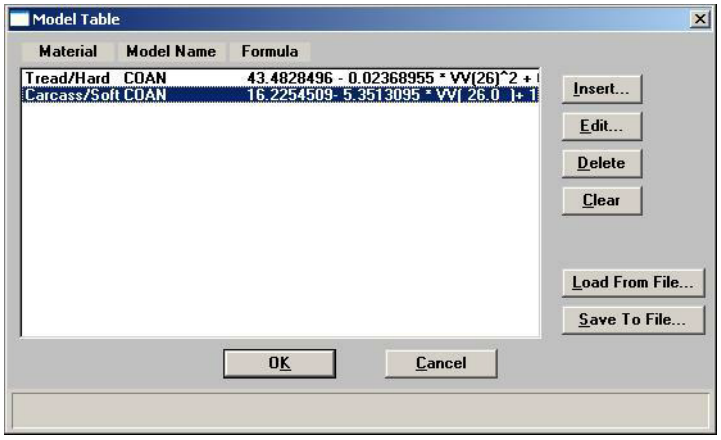


Click the down arrow at the end of the field to display a list of reference materials.

Delete Removes the selected reference material from the list. You can add it back to the list using the **Insert** button.

User Models

Enables you to enter calculated parameters, such as alternate COAN, from void volume curves based on your own experimentation. The calculation results will appear on the Summary Report when selected.

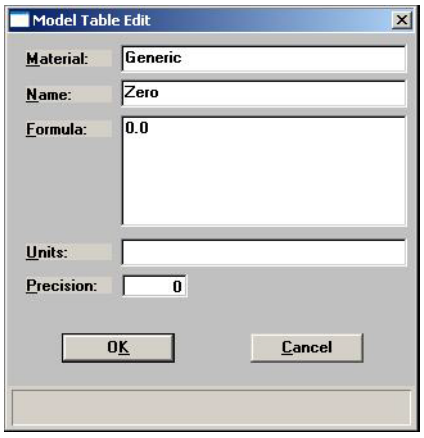


Material Displays the type of material.

Model Name Displays the name of the model.

Formula Displays the formula to be used for the model.

Insert Displays the Model Table Edit dialog.



Material Enter the name of material to be associated with this model.

Name Enter a name for the model.

Formula Enter a formula for the model. The formula can contain any of the following:

+, -, /, *, ^,
parentheses are allowed,
numeric constants.

Math functions:
exp (natural exponential, not base 10)
log (natural log, not base 10)

Note the capitalization in the following variables. The variables must be entered with letters capitalized as shown below. Also note there are related functions that vary only in whether they use an applied or a geometric mean pressure as the argument. For functions that take an applied pressure, two identical forms are provided (e.g., Height and HeightA).

Collected data functions:
Height(applied pressure in MPa) (cm)
HeightA(applied pressure in MPa) (cm)
HeightM(geometric mean pressure in MPa) (cm)
Work(applied pressure in MPa) (cm^3/g)
WorkA(applied pressure in MPa) (cm^3/g)
WorkM(geometric mean pressure in MPa) (cm^3/g)
VV(applied pressure in MPa) (cm/Newton)
VVA(applied pressure in MPa) (cm/Newton)
VVM(geometric mean pressure in MPa) (cm/Newton)
dHdF(applied pressure in MPa)
dHdFA(applied pressure in MPa)
dVdP(applied pressure in MPa)
dVdPA(applied pressure in MPa)
dHdFM(applied pressure)(cm)
dVdPM(applied pressure)($cm^{3)}$
ApparentDensity(applied pressure in MPa) ($g/cm^3/g$)
ApparentDensityA(applied pressure in MPa) ($g/cm^3/g$)
ApparentDensityM(geometric mean pressure in MPa) ($g/cm^3/g$)

Formula

Collected constants:
- Mass (g)
- Piston Area (cm^2)
- TopOfSample (cm)
- BulkDensity
- ResidV (cm^3, residual void volume)
- ResidH (cm, residual top-of-sample)
- WorkPressureSlope (Newton-m/g/MPA, applied pressure)
- WorkPressureSlopeA (Newton-m/g/MPA, applied pressure)
- WorkPressureSlopeM (Newton-m/g/MPA, geometric mean pressure)
- *User Parameters**

*The user parameters on the Sample Information dialog (refer to **User Parameters**, page **5-5**) can be used in the formula as well. The names of the user parameters must match the ones specified in the sample default file.

When entering a formula, you can enter constants with the names of the user parameters defined in the sample defaults file (refer to **Sample Defaults**, page **8-6**).

When calculating the value for the formula, the software will look up the user parameter with that name in the sample file. If it does not exist, then the formula will not be evaluated.

Units

Enter the units in which the calculation results will be expressed.

Precision

Enter the number of decimal places to be included in the calculation results.

Edit

Enables you to edit the selected model.

Delete

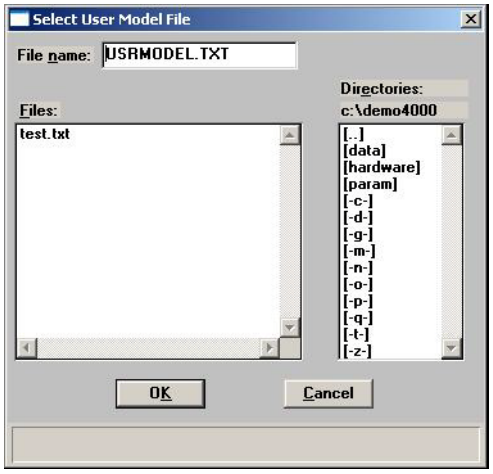
Deletes the selected model.

Clear

Clears all entries from the table except one; one is required.

Load from File

Displays the Select User Model File dialog, allowing you to load a model file saved in text (.txt) format.

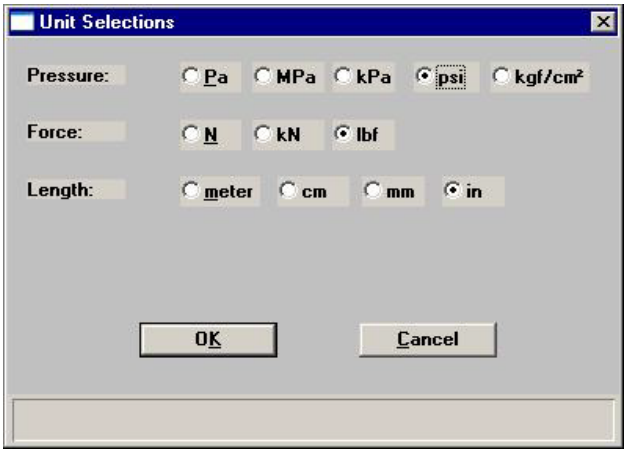


Save to File

Save the selected model to a text file. Refer to the dialog shown above.

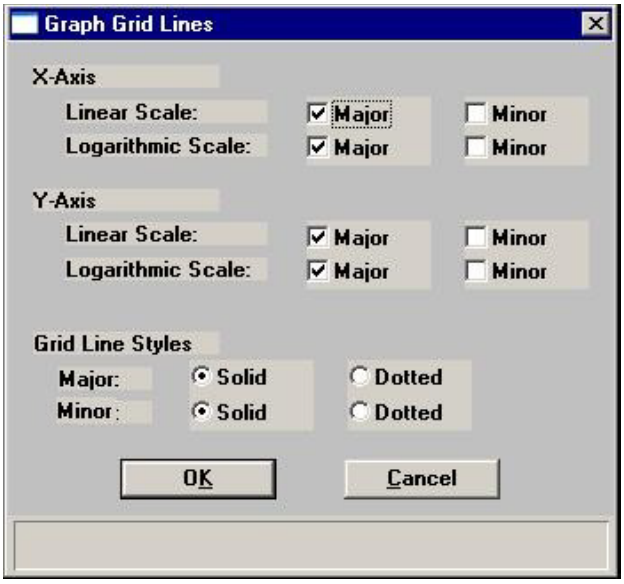
Units

Choose the manner in which to display pressure, force, and length; the Units Selections dialog is displayed.



Graph Grid Lines

Choose the type(s) of grid lines to show on your reports; the Graph Grid Lines dialog is displayed.



X-Axis
Y-Axis

Choose **Major** and/or **Minor** lines to display in printed reports for the **Logarithmic** and **Linear** scales.

Grid lines are not shown if these items are not selected.

Grid Line Style

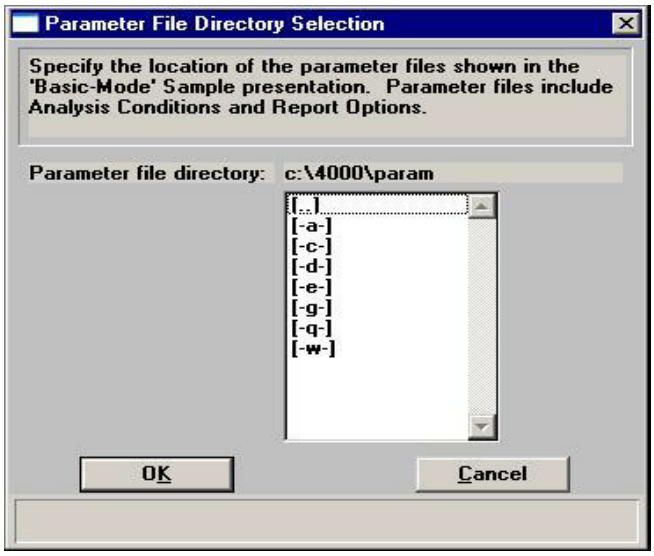
Choose the type of grid line to display.

Live Graph

This option enables you to change the view of the graph during data collection. You can change the x-axis to scale data on a Linear Scale or Logarithmic Scale.

Parameter Files Directory

Edit the location for predefined parameter files displayed in the drop-down lists on the Basic and Restricted Sample Information dialogs. The current directory specified for parameter files is displayed above the directory window.



The directory specified here is the one you should use when creating parameter files to be included in the drop-down lists on the Basic and Restricted sample information dialogs. The default directory is **param** and includes several parameter files supplied with the analysis program. If you specify a different directory, these files will not be included in the drop-down lists unless you copy (or move) them to the new directory.

If you wish to continue to use the **param** directory for parameter files, it displays as the default when saving parameter files.

Service Test Mode

Calibration procedures are included in the DVVA II 4000 operating program. Some of these calibrations can be performed only with the assistance of a trained Micromeritics service representative. When you select **Options > Service Test Mode**, a dialog prompting you to enter a password is displayed. This password is coded to change on a regular basis and will be provided by your service representative.

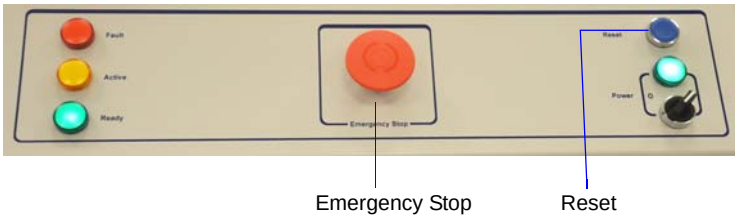
9. TROUBLESHOOTING AND MAINTENANCE

This chapter describes common operational problems and their solutions, and maintenance procedures. If further assistance is needed after following the procedures in this chapter, contact a Micromeritics Service Representative.

Troubleshooting

Operating problems encountered with the DVVA analyzer are usually easily corrected. Typical problems and the steps required to correct them are described in the following table.

Table 9-1. Common Operational Problems

Problem	Cause	Solution
Fault indicator will not turn off	Safety shield is not completely closed.	Slide the safety shield all the way down.
	Drawer is open.	Close the drawer.
	The Emergency Stop button is engaged.	Turn the **Emergency Stop** button to the right to release it, then press **Reset**.
		
	The USB cable was disconnected and reconnected while the analyzer was on.	Turn the analyzer on after the USB cable has been connected.
	Application is not operating.	Start the application.
	The Windows program has closed unexpectedly.	Restart the computer, turn on the analyzer, and restart the application.

Problem	Cause	Solution
Inconsistent results when conditioning the tip	Different amounts of the sample were used.	Use 1.0000 gram, ± 0.05 (determined to nearest 0.0001 gram) of sample for each analysis.
	The same type of sample was not used for all analyses.	Use the same type of sample for all analyses.
	All samples were not prepared in the same manner.	Use the same preparation method for all samples.
	The piston tip is not securely affixed to the piston.	Moderately tighten the tip using a 3/8-in. wrench.
	The upper or lower piston tip is dirty.	Wipe the piston tips with a Kimwipe or paper towel between each blank analysis and each sample analysis.
	The piston tip is damaged.	Replace with a new tip and perform the conditioning procedure.
	Not enough sample runs have been performed.	Perform additional sample runs.

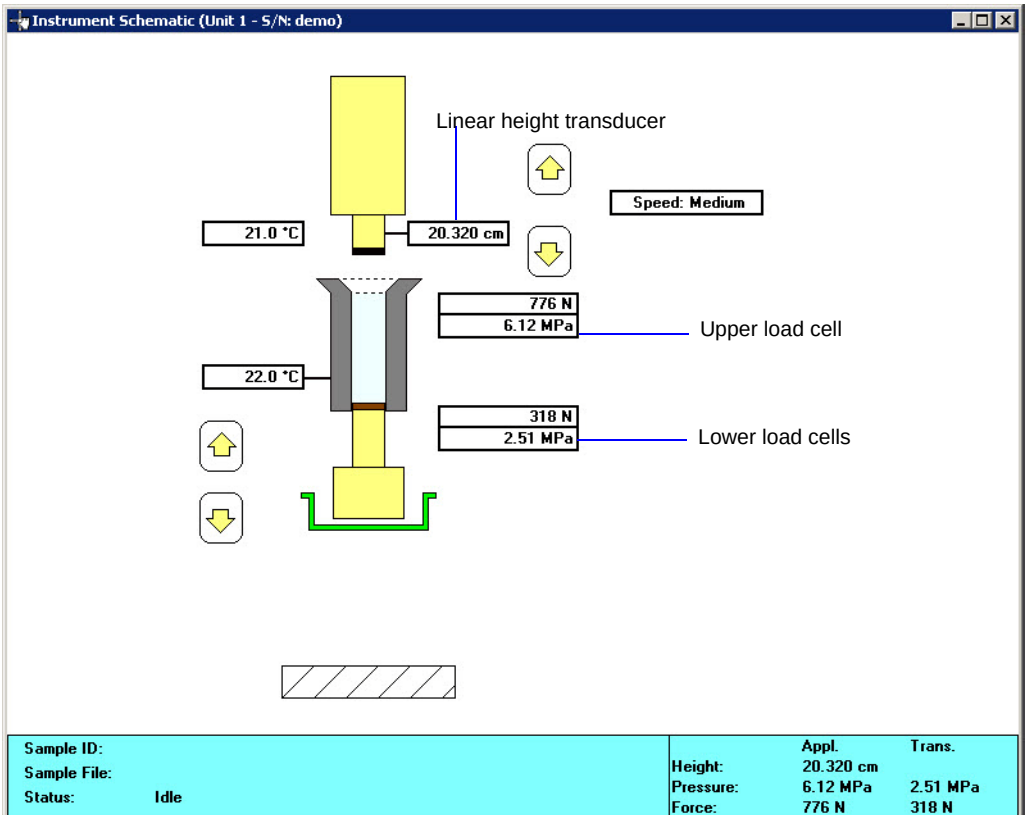
Problem	Cause	Solution
Lower piston motor reports errors	The sample is exerting a high residual force on the lower piston after sample compaction.	Use the provided pellet removal tool to break up the compacted sample in the sample chamber, then manually lower the lower piston to the tray-loading position. Refer to **"Lower Piston Release Procedure" on page 9-11.**
	The lower piston tip is not securely affixed to the lower piston in the sample tray.	Moderately tighten the lower piston tip.
	The lower piston tip is worn or damaged.	Replace with a new tip.
	The wrong tray is inserted in the analyzer.	Insert the correct tray.
Readings in the instrument schematic display all zeros.	The DVAA II 4000 was not recognized by Windows, preventing the data acquisition drivers from loading.	Perform **"Full Power-On Procedure" on page 9-4.**
Piston will not move	Manual control is not enabled	Select **Unit > Enable manual control**.
	You forgot to press **Reset**.	Press **Reset**.
	One of the piston circuit breakers has tripped.	Wait a few minutes and reset the breaker.
	The opposing piston is not in the proper position.	Select **Unit > Enable manual control** and move the piston to the proper position.

Full Power-On Procedure

The power-on procedure is to be performed after the instrument has been shut down for an extended period of time or after a loss of power.

1. Make sure the instrument and computer are in the following state before continuing:
   a. Computer is turned OFF and the computer power cable is disconnected.
   b. The instrument **MAIN POWER** switch (on back panel) is in the OFF position.
   c. The instrument **Power** switch on the front panel is in the OFF position.
   d. The USB cable is disconnected from the instrument.
2. Place the instrument **MAIN POWER** switch on the back panel to the ON position.
3. Reconnect the computer power cable.
4. Connect the USB cable to the instrument.
5. Turn on the computer.
6. If required, allow Windows to install the drivers for any new hardware found. Refer to **"Power-On Troubleshooting" on page 9-6.**
7. Place the instrument front panel **Power** switch in the ON position.
8. Start the DVVA II 4000 software.

9. Display the instrument schematic and ensure that all readings show valid values. If all are displaying 0.0, refer to **"Power-On Troubleshooting" on page 9-6.**



10. Select **Calibration > Set Lower Piston Home...**, and press the **Start** button.

Full Power-Off Procedure

This procedure is to be used when the computer needs to be shut down for an extended period of time.

1. Exit the DVVA II 4000 software.
2. Place the power switch on the front panel of the instrument in the OFF position.
3. Disconnect the USB cable from the instrument.

The USB cable must be disconnected from the instrument before you turn off the instrument MAIN POWER switch on the back panel of the instrument to avoid complications when reconnecting the instrument to the computer.

4. Place the instrument **MAIN POWER** switch on the back panel in the OFF position.

If accessibility to the back panel is a problem, plug the instrument into a power strip with an appropriate current rating and use the power strip to turn on the main power.

Power-On Troubleshooting

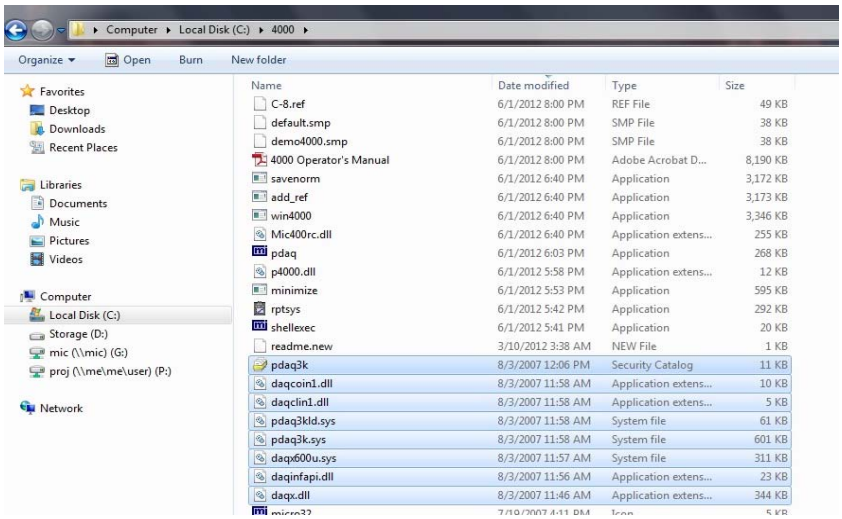
Problem

Computer is connected to the DVVA II 4000 and Windows is trying to update the driver software.

Action

Allow Windows to search automatically for the driver software. This will enable Windows to install the device drivers that were placed on the computer during the DVVA II 4000 software installation.

If Windows requests the location of a driver file, browse to the location of the DVVAII 4000 software installation. A copy of the drivers (USB loader and PDAQ driver) has been placed there.

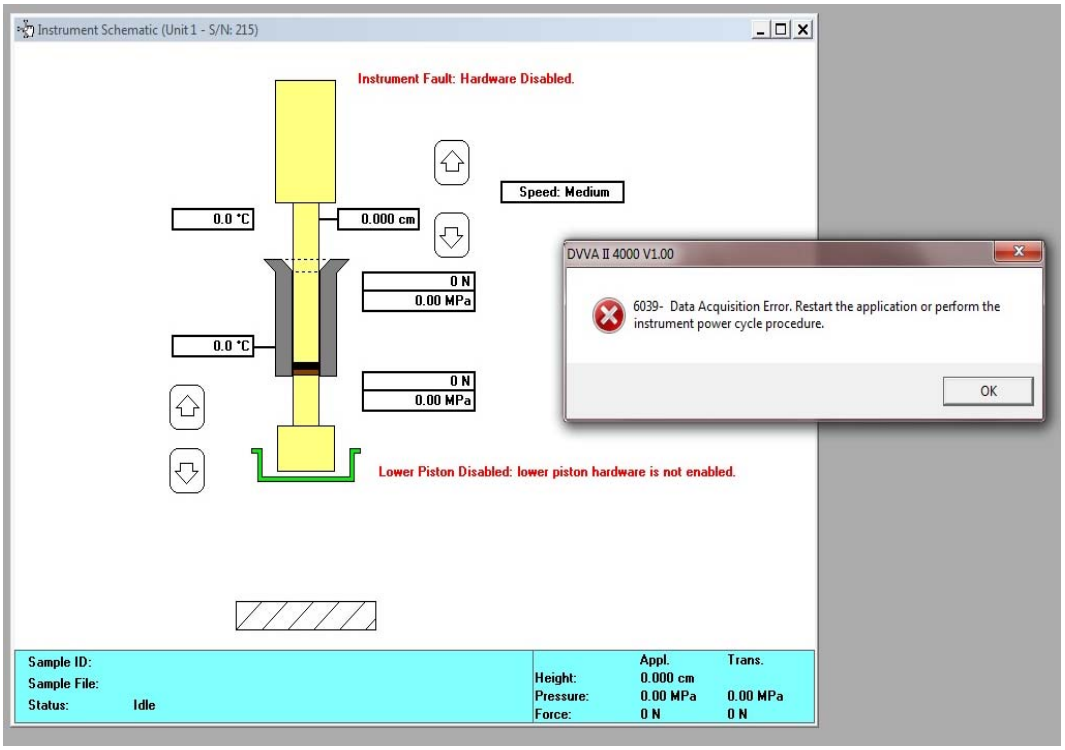


Windows may make multiple driver update requests. One is related to the lower drive communications device (USB CAN adapter) and two are related to the data acquisition device (USB2 Loader Device and the DVVA 4000).

The windows shown below may be displayed. Click **Next** to install the drivers.

Problem

The instrument schematic in the DVVA II 4000 software is showing 0.0 readings (as shown below). This is caused by Windows not detecting the USB data acquisition device.



Perform Action 1 below. If this does not correct the problem, follow the Actions below in sequence until the instrument is reconnected to the computer.

Action 1

1. Exit the DVVA II 4000 software.
2. Wait a about 10 seconds, then restart the software.

Action 2

1. Perform the Full Power-Off Procedure described on page **9-5**.
2. Exit Windows and shut down the computer.
3. Wait about 10 seconds.
4. Perform the Full Power-On Procedure described on page **9-4**.

If Windows detects new hardware but does not automatically load the drivers, perform the device driver installation process described under **Action** on page **9-6**.

Verify that the instrument schematic in the DVVA II 4000 software is not showing 0.0 readings for the linear height transducer and the upper and lower load cells.

Action 3

1. Perform the Full Power-Off Procedure described on page **9-5**.
2. Exit Windows and shut down the computer.
3. Unplug the USB cable at the computer, wait about 10 seconds, and then plug into a different port in the computer.
4. Perform the Full Power-On Procedure described on page **9-4**. Windows should automatically load new drivers due to the new port. If not, perform the device driver installation described under **Action** on page **9-6**.

Action 4

1. Perform the Full Power-Off Procedure described on page **9-5**.
2. Exit Windows and shut down the computer.
3. Unplug the computer power cable.
4. Wait 15 minutes.
5. Perform the Full Power-On Procedure described on page **9-4**. Before starting the DVAA II 4000 software check to see if the drivers are loaded.
6. If the data acquisition driver still fails to load, open the Windows device manager.
   - Windows Explorer: Click the System icon in the Control Panel.
   - Windows XP: Choose the Hardware tab in the System control panel and click on Device Manager.
   - Windows 7: Click on Device Manager in the left panel of the System window.
7. If the data acquisition driver has successfully loaded earlier, then an entry named "Micromeritics DVVA" will be shown in the Device Manager window. If the driver has failed to load, this entry will be missing.

   If this entry is missing, perform the device driver installation process described under **Action** on page **9-6**.

Verify that the instrument schematic in the DVVA II 4000 software is not showing 0.0 readings for the linear height transducer and the upper and lower load cells. Otherwise, repeat Action 4 except for step 6 . For step 6, you should change USB ports on the computer and then continue to step 7 if necessary.

Action 5

1. Perform the Full Power-Off Procedure described on page **9-5**.
2. Unplug the instrument power cable.
3. Exit Windows and shut down the computer.
4. Unplug the computer power cable.
5. Leave the cables unplugged overnight.
6. Perform the Full Power-On Procedure described on page **9-4**. Before starting the DVVA II 4000 software, check to see if the drivers are loaded.
7. If the data acquisition driver has successfully loaded earlier, then an entry named "Micromeritics DVVA" will be shown in the Device Manager window. If the driver has failed to load, this entry will be missing.

   If this entry is missing, perform the device driver installation process described under **Action** on page **9-6**.

Once the instrument is functioning properly, do not turn off the computer power switch or the DVVA MAIN POWER switch located on the rear panel of the instrument.

The DVVA II 4000 analyzer should not be connected via a USB cable to a computer unless the DVAA II 4000 is powered (the MAIN POWER switch on the rear panel is in the ON position).

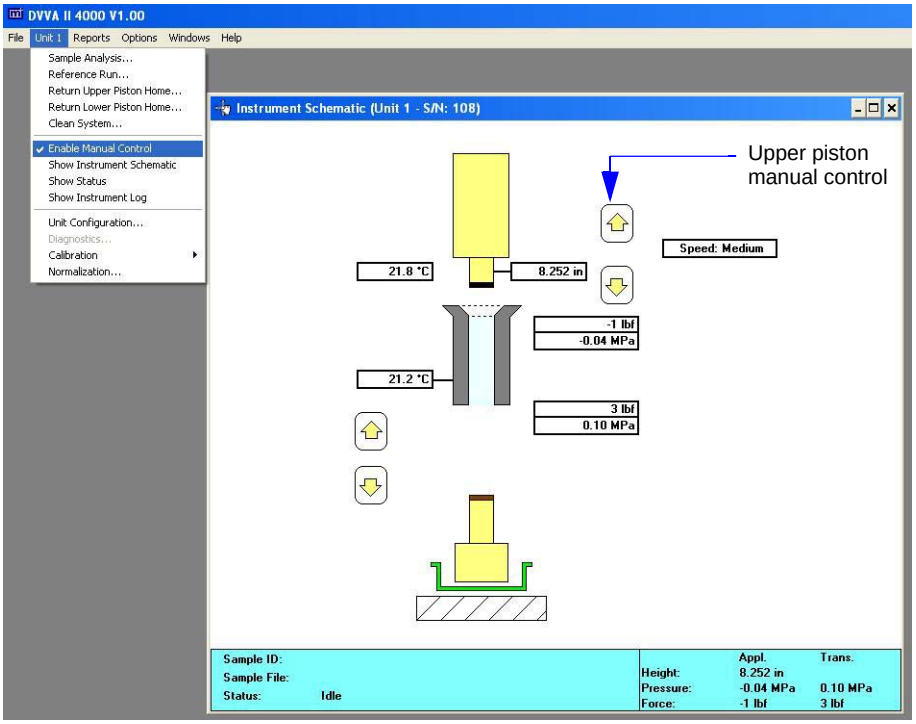
Lower Piston Release Procedure

Perform Action 1 below. If this does not correct the problem, perform Action 2.

Action 1

1. Ensure that the upper piston is in the raised position. If it is not, select **Unit 1 > Schematic,** then **Unit 1 > Enable Manual Control** to display the Manual Control screen.

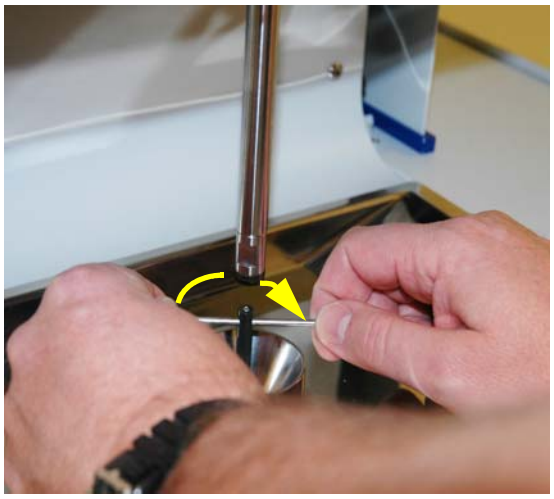
   Use the icon next to the upper piston to raise it to its home position.



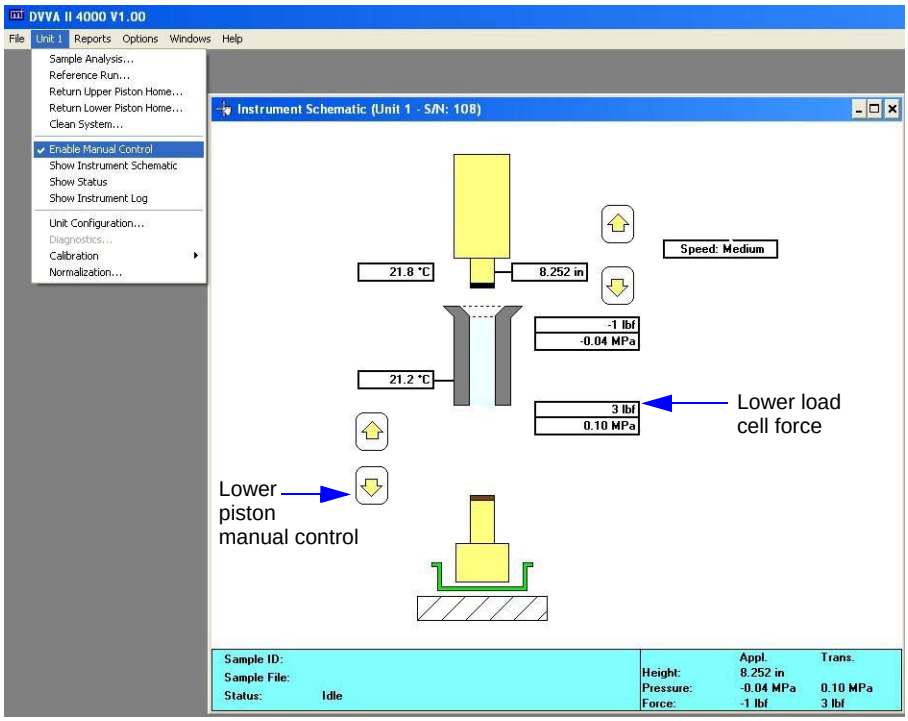
2. If the safety shield is not already raised, raise it to its upper position.

3. Retrieve the pellet removal tool (shown below) that was included in the instrument accessories kit.

4. Carefully place the tool into the compression chamber and while applying pressure, rotate the tool.



5. The compressed pellet should begin to break up and the lower load cell force shown in the Manual Control window should decline, as shown below. When the lower load cell force has fallen to approximately 230 kg (500 lbs.), remove the tool and manually move the lower piston downward until it reaches its home position using the icon.



6. If the lower piston moves to its home position:

   a. Close the safety shield.

   b. Press the **Reset** button.

   c. Proceed to Step 7.

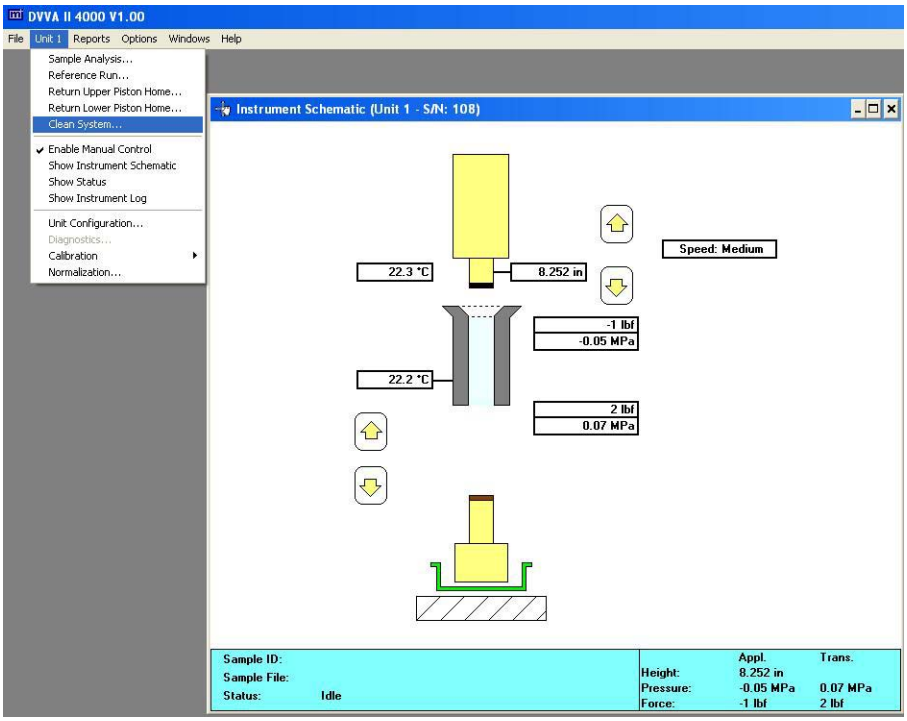
If, after several attempts performing steps 4 and 5, the piston cannot be moved to its home position:

a. Close the safety shield.

b. Press the **Reset** button.

c. Proceed to **“Action 2” on page 9-15.**

7. Select **Unit 1 > Clean System f**rom the main menu to clear the compressed pellet from the compression chamber.



8. The DVVA II should now be operational.

Action 2

If Action 1 does not solve the problem, you can manually release the piston as described below.

Never override the instrument panel sensor or operate the instrument with the panel removed.

1. Support the lower front panel from the bottom and remove the four screws shown in the photograph below.

2. Remove the panel and set it aside.

3. Using a 9/16-in. (14mm) open-ended wrench, release the lower piston as shown below.

While the expandable cover is removed, ensure that no foreign matter is allowed to enter inside the cover. Also, avoid disturbing any grease found on the screw thread.

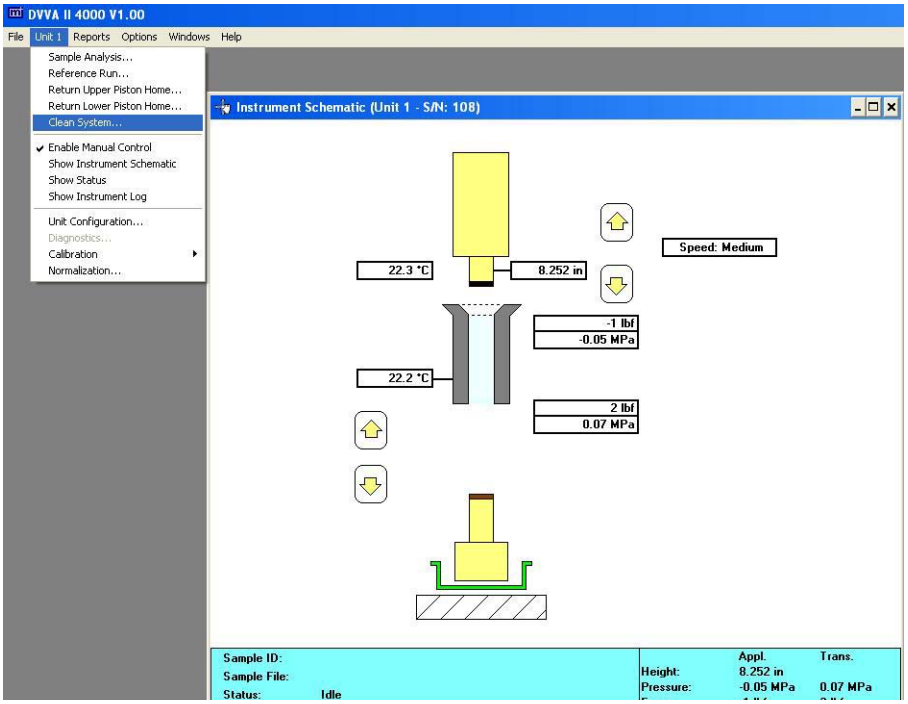
Be careful when releasing the piston, the internal components could cause injury if your hands scrape against them.

4. Ensure that the expandable cover returns properly to its circular groove.
5. Replace the lower front panel and secure it with the four screws.
6. Close the safety shield.
7. Press the **Reset** button on the instrument.

8. Select **Unit 1 > Return Lower Position Home** from the main menu.

9. Ensure that no foreign debris has fallen into the compression chamber.

10. Select **Unit 1 > Clean System** from the main menu to clear the compressed pellet from the compression chamber.



11. The DVVA II should now be operational.

Maintenance

Cleaning Analyzer and Components

- Use a soap-based detergent to clean the exterior casing of the analyzer.

Do not use detergent or other cleaners on the moving components of the instrument.

Perform a full power-off procedure before you clean around any of the connectors on the rear panel of the instrument (refer to page 9-5). Then perform a full power-on procedure to turn the instrument back on (refer to page 9-4).

- For the sample shield; first wipe with a soft cloth to remove particles, then use a household window cleaner.
- Use a paper towel or Kimwipe or paper towel to clean the piston tip; never use a solvent.

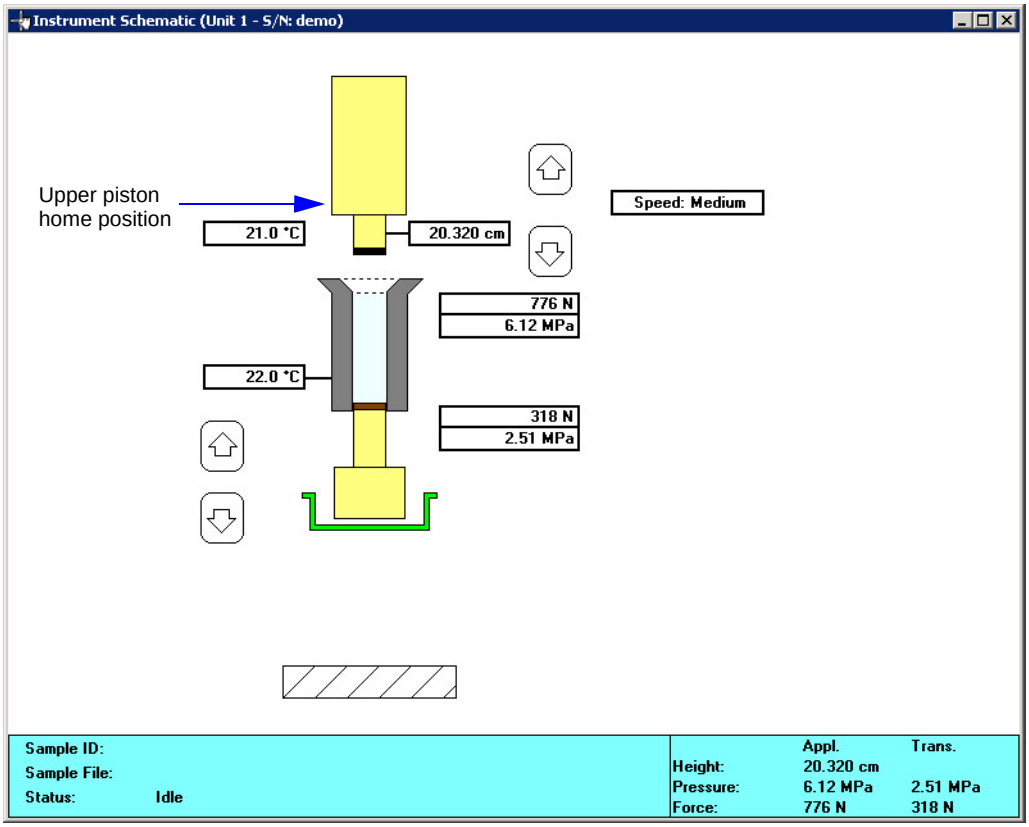
- You may use a vacuum cleaner on the sample and waste trays.

Replacing and Conditioning the Piston Tip

The piston tip should be replaced when deemed necessary; and must be conditioned before using.

Replacing the Upper Piston Tip

1. Select **Unit 1 > Return Upper Piston Home** to move the piston to its uppermost position, completely out of the sample chamber.



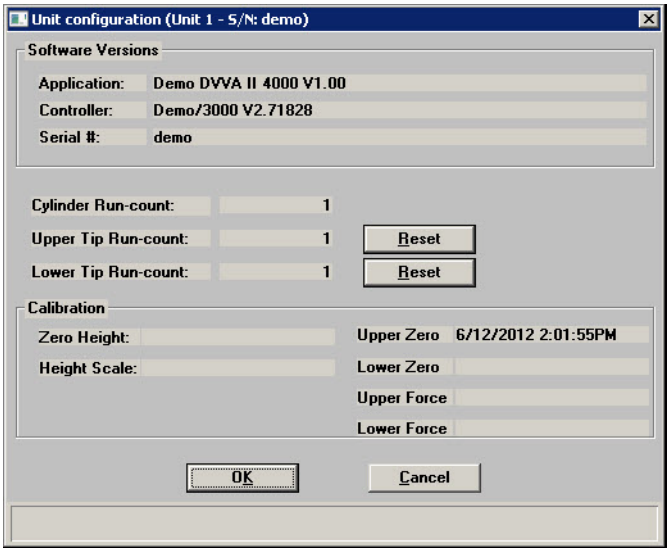
2. Slide the sample compartment shield to its uppermost position.

3. Place a stiff piece of paper or cardboard over the top of the sample funnel to prevent the loosened tip from accidentally falling down into the chamber.

4. Using a 3/8-in. wrench, rotate to the left to loosen and remove the piston.

5. Install a new piston tip. Using the same wrench, moderately tighten the piston tip.

6. Select **Unit 1 > Unit configuration** to display the Unit configuration dialog.



7. Click the **Reset** buttons to reset the **Upper Tip Run count** to 0 (zero), then click **OK** to close the dialog.

Replacing the Lower Piston Tip

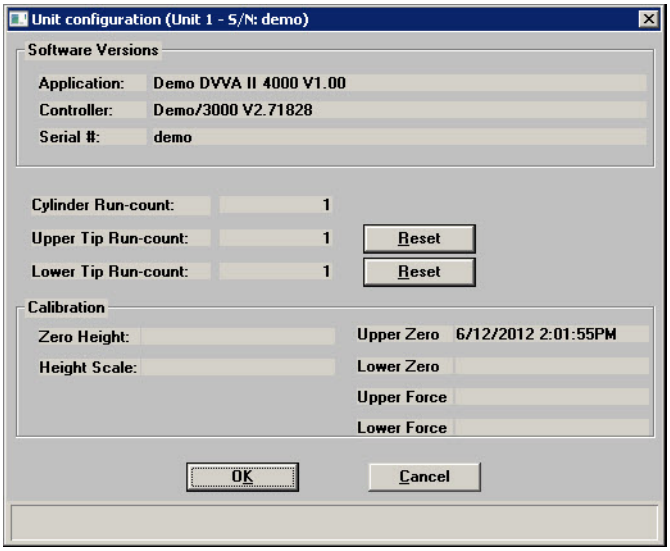
1. Remove the lower piston tray.

2. Using a 3/8-in. wrench, rotate to the left to loosen and remove the piston in the sample tray.

3. Install a new piston tip. Using the same wrench, moderately tighten the piston tip.

4. Replace the lower piston tray and press the **Reset** button on the analyzer.

5. Select **Unit 1 > Unit configuration** to display the Unit configuration dialog.



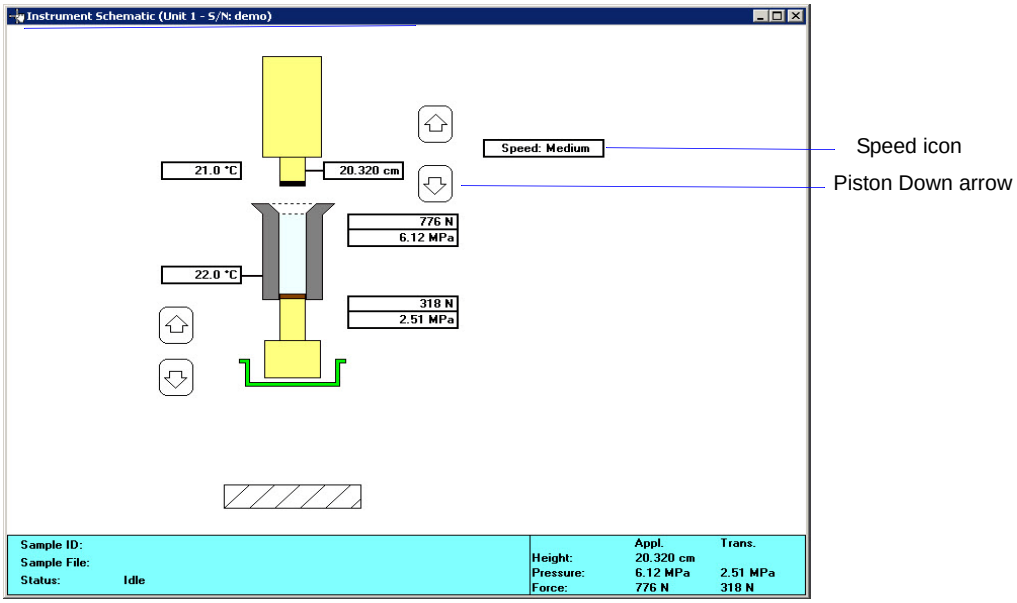
6. Click the **Reset** buttons to reset the **Lower Tip Run count** to 0 (zero), then click **OK** to close the dialog.

Conditioning the Piston Tip

A new piston tip should always be conditioned before using. Prepare 10 samples, using 1 gram (± 0.001 gram) each of the same material for this procedure.

Use of certain USB devices or the addition or removal of a USB device during an analysis may cause a delay in data acquisition, resulting in a loss of data or the cancellation of an analysis. Avoid the use of attached USB devices such as flash drives, digital audio players, or cellular phones during an analysis. Additionally avoid adding or removing USB devices during an analysis.

1. Click **Unit 1 > Show Instrument Schematic**, then **Unit 1 > Enable Manual Control**.
2. Move the lower piston to its uppermost position.
3. Right-click on the **Speed** icon and select **Medium**.



4. Slide the sample compartment shield down, then press the **Reset** button.
5. Using the instrument schematic, press and hold down the piston **Down** arrow until the pressure display shows 1000 lbf. or greater.
6. Return the lower piston to its lowest position.
7. Select **Unit 1 > Return Upper Piston Home** to return the piston to its uppermost position.
8. Select **Unit 1 > Enable Manual Control** to remove the check mark and disable manual control.
9. Minimize or close the instrument schematic.

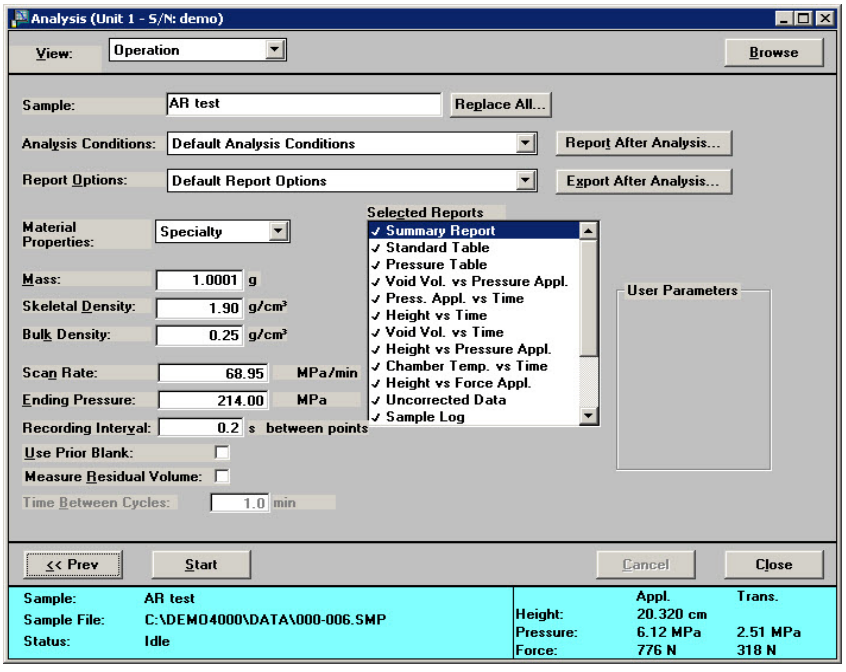
10. Slide the sample compartment shield up; wipe the piston tip with a Kimwipe or paper towel.

11. Slide the sample compartment shield down; press **Reset**.

12. Select **Unit 1 > Sample Analysis**; the Analysis dialog is displayed with the Open Sample Information dialog positioned on top.

13. Click **OK** to accept the next sequenced number in the **File name** field; the Analysis dialog containing file defaults is displayed.

14. Click **Replace All** and select the file named **COND.smp**, then click **OK**.

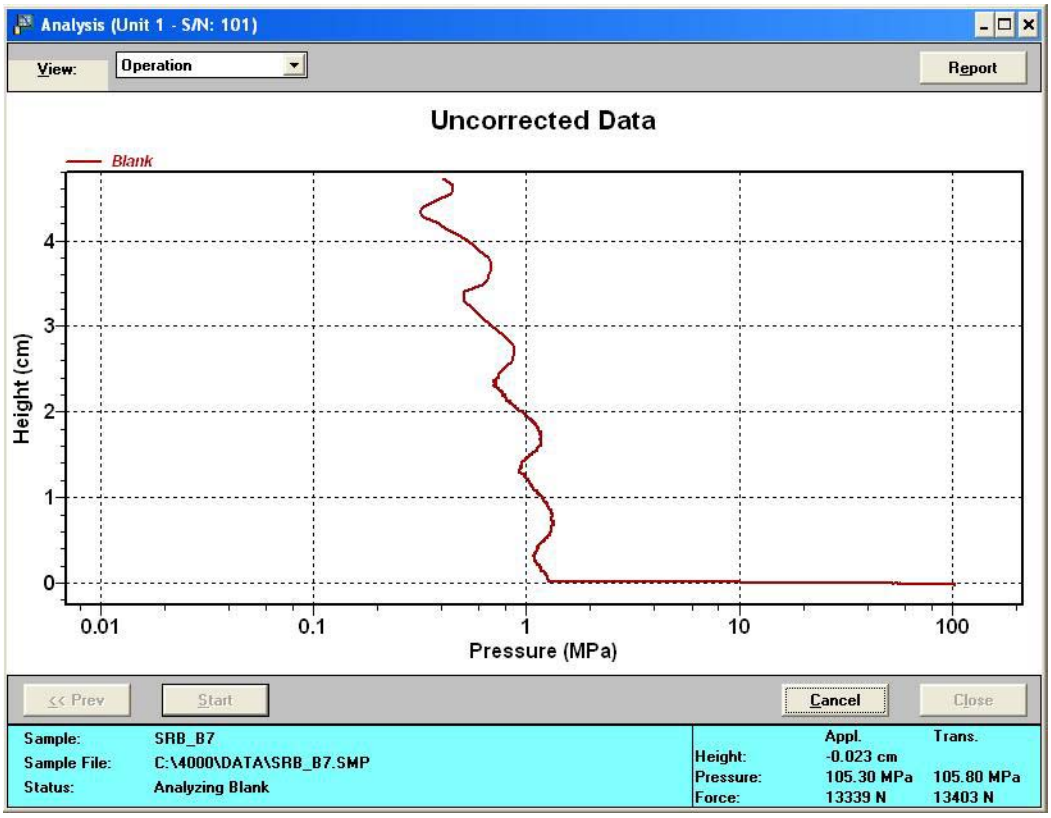


All appropriate values will be inserted into the dialog fields.

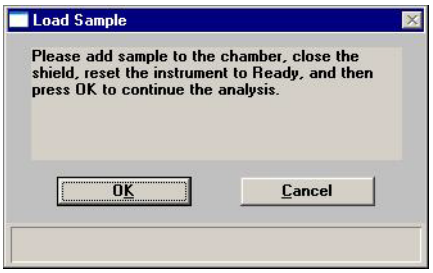
15. Edit the description in the **Sample field** by adding a **1** indicating this is the first of 10 analyses; 10 analyses are performed when conditioning the piston tip.

16. Enter the sample mass in the **Mass** field

17. Click **Start** to begin the analysis; a dialog showing data as collected is displayed.



18. After the blank analysis is complete, a dialog prompting you to add sample is displayed. Do not click **OK** until you have placed the sample in the chamber.

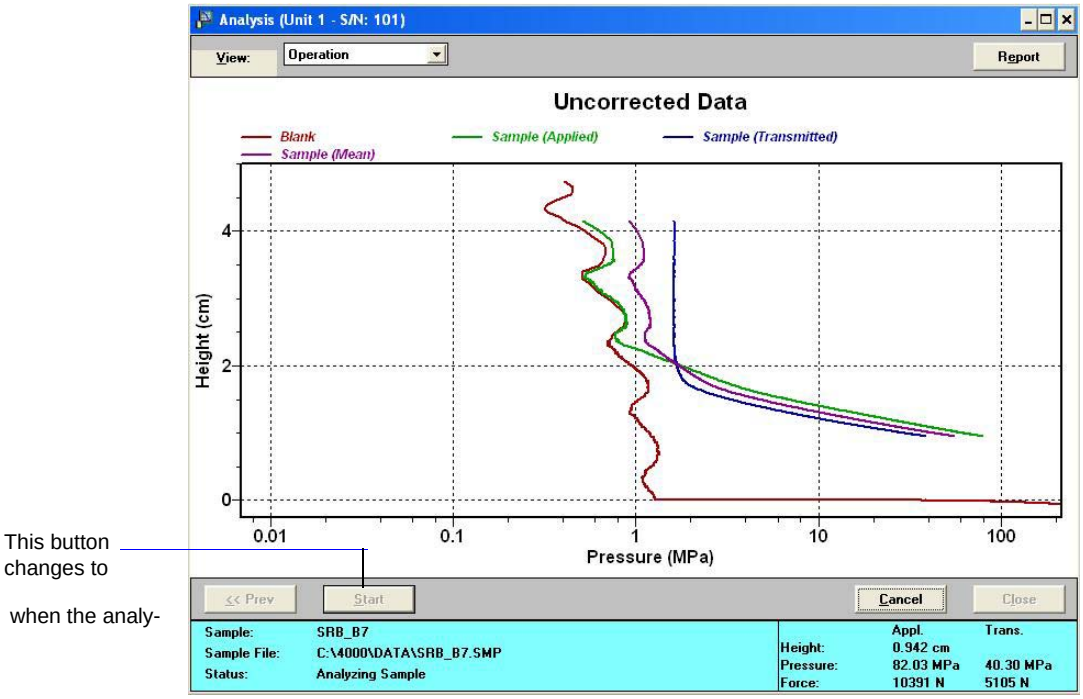


The piston automatically returns to the home position at the completion of the blank analysis.

19. Slide the sample compartment shield up; wipe the piston tip with a Kimwipe or paper towel.

20. Pour the sample into the sample chamber and close the shield; press **Reset**.

21. Click **OK** on the Load Sample dialog to continue the analysis; a dialog stating **No Data Available** is displayed until analysis data starts to collect, then the following dialog is displayed.



The piston automatically returns to the home position when the analysis is finished.

22. Slide the shield up and wipe the piston tip with a Kimwipe or paper towel, then close the shield; press **Reset**.

23. Click **Next** on the Data Collection view of the Analysis dialog to return to the first view of the Analysis dialog.

24. Click **Browse**; the Open Sample Information dialog is displayed.

25. Click **OK** to accept the next sequenced number in the **File name** field; the Analysis dialog containing file defaults is displayed.

26. Enter the correct mass for the sample being analyzed.

27. Repeat steps 13 through 24 for the remaining nine samples. Be sure to:

    - change the Sample identification sequentially
    - wipe the piston tip after each blank analysis and sample analysis

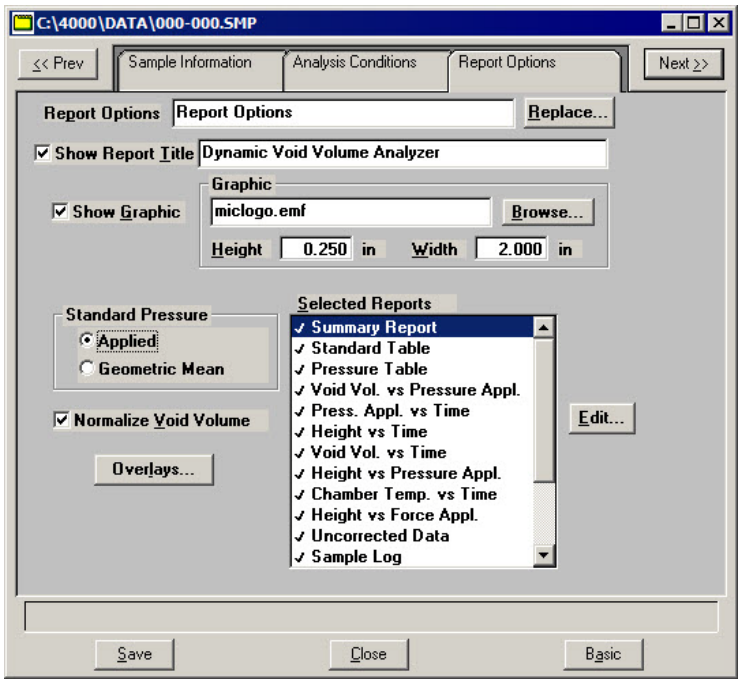
28. Advance to **Overlaying Results** to determine if the piston is sufficiently conditioned.

Overlaying Results

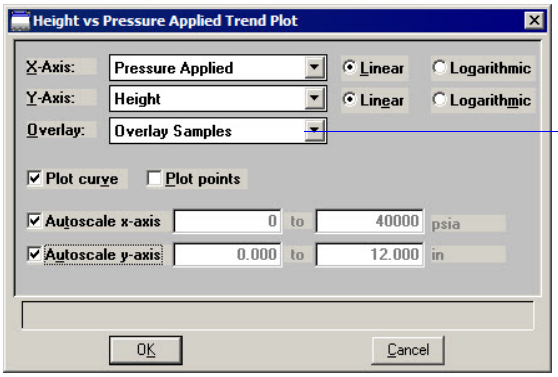
When results start to be consistent, the piston tip is sufficiently conditioned. Perform the following steps to overlay the results from the last six analyses:

1. Select **File > Open Sample Information** and choose the fifth file of the condition series.

2. Click the Report Options tab to display the Report Options dialog.



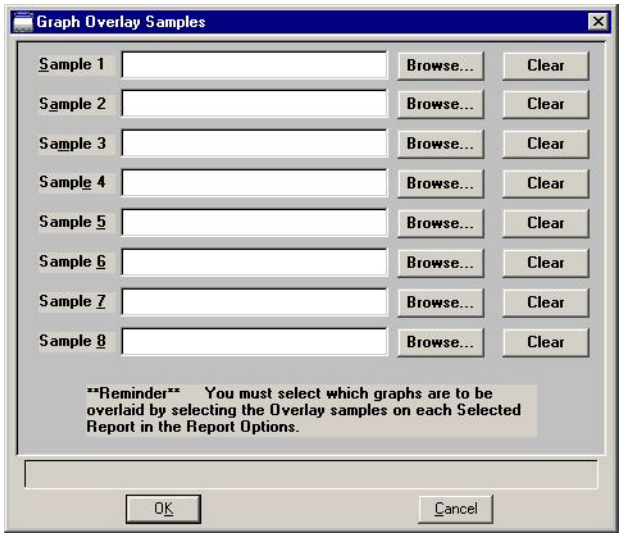
3. Highlight **Height vs Pressure Appl** and click **Edit**; the Height vs. Pressure Trend Plot dialog is displayed.



Click the down arrow and choose Overlay Samples.

4. Click the down arrow to the right of the **Overlay** field and choose **Overlay Samples**, then click **OK** to return to the Report Options dialog.

5. Click **Overlays** on the Report Options dialog; the Graph Overlay dialog is displayed.



6. Click **Browse** to the right of the first five **Sample [n]** fields and select the remaining files used in the conditioning procedure.

7. Click **OK** to return to the Report Options dialog.

8. Click **Save** on the Report Options dialog; do not close the dialog.

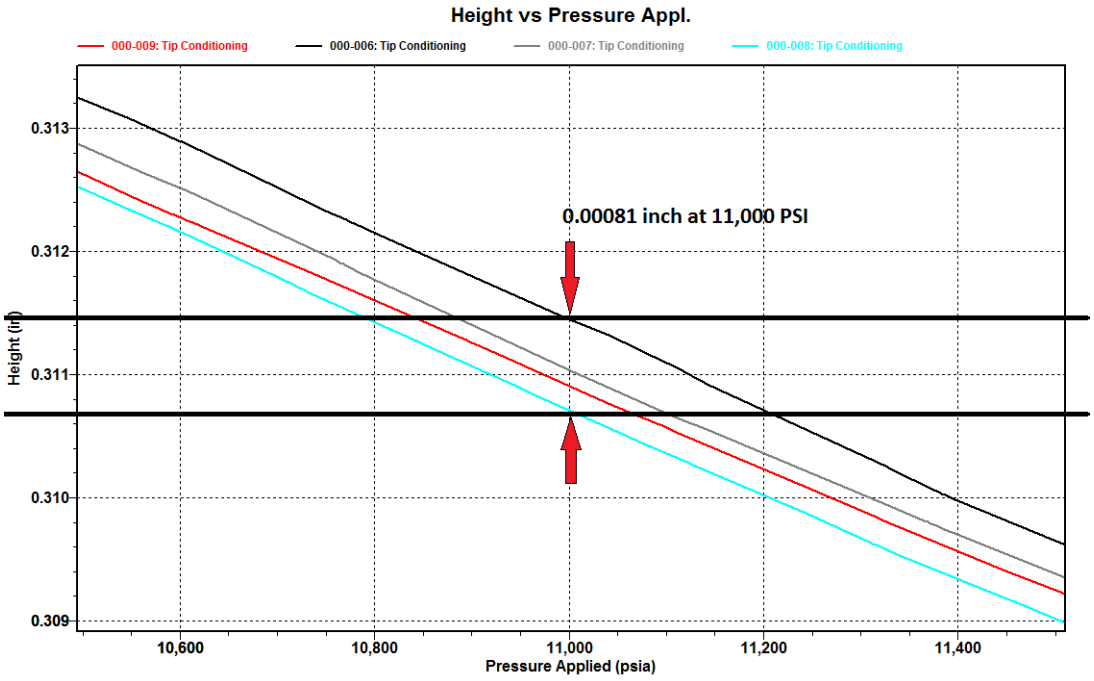
9. Click **Reports > Start Report**; the Start Report dialog is displayed. Note that the number of your open file defaults to the **File name** field.

10. Be sure the destination is set at **Screen**, then click **OK**; the Selected Reports dialog is displayed.

11. Click **OK**; the report window containing overlay results is displayed. Click the **Height vs Pressure** tab to display the data.

12. Right-click in the graph area and choose **Autoscale** from the shortcut menu.

13. Zoom in on these portions of the graph: 5,000, 15,000 and 25,000 psi. Continue zooming on each until you can determine if the curves for three sequential runs are within 0.001 inch.



If the curves are not within this range, repeat analyses until three sequential curves are obtained. If after a total of 20 analyses you still have not obtained these results:

- Refer to **Table 9-1. Common Operational Problems**, page **9-1** for corrective solutions.
- Contact your service representative if the solutions in Table 9-1 do not correct the problem.

Normalization

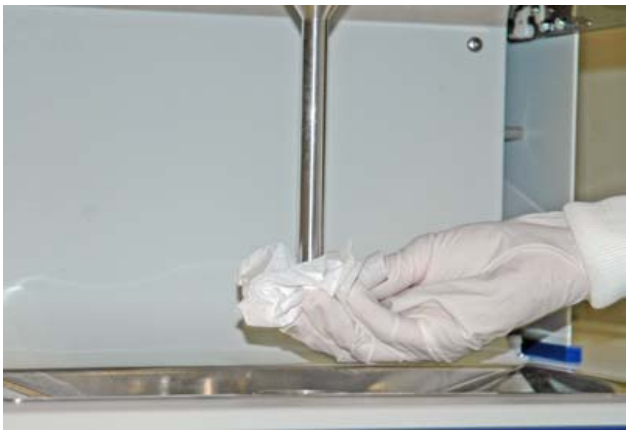
The instrument should be normalized with SRB series reference materials on a regular basis to compensate for wear on the piston tip. This is accomplished by performing two reference runs on each reference material on a *monthly* basis, or, one run on each reference material *two times a month*. This will consist of 12 runs; two each on the six reference materials.

Two runs each are sufficient for maintaining normalization. When you replace the piston tip, you should perform four runs each. This will be a total of 24 runs when a new tip has been installed.

1. Perform two blank analyses as described in steps 1 through 16 under the heading **"Replacing and Conditioning the Piston Tip" on page 9-19**.

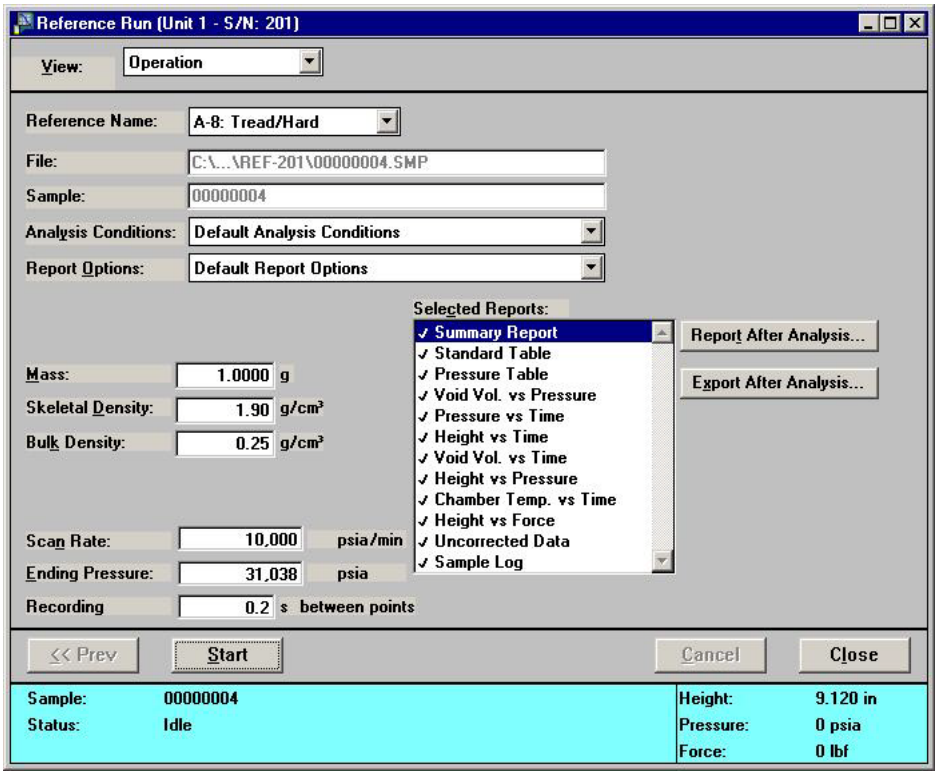
2. Prepare two samples of one of the reference materials (prepare according to the instructions used for everyday samples, page **3-13**).

3. Wipe the piston tip with a Kimwipe or paper towel, close the sample shield, and press **Reset**.



Do not load the reference material until prompted to do so; a blank run is performed first.

4. Select **Unit > Reference Run**; the Reference Run dialog is displayed.



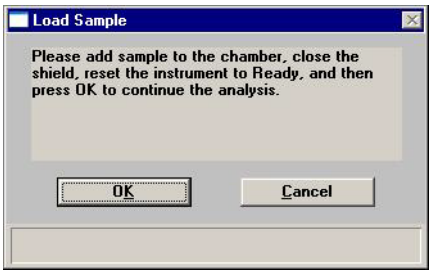
5. Enter the sample mass in the **Mass** field.

6. Using the table below, enter in the **Bulk Density** field the bulk density of the reference material for this run.

Bulk Density for SRB Reference Materials	
Reference Name	**Bulk Density**
A-8 Tread/Hard	0.41
B-8 Tread/Hard	0.31
C-8 Tread/Hard	0.29
D-8 Carcass/Soft	0.64
E-8 Carcass/Soft	0.44
F-8 Carcass/Soft	0.34

7. Click **Start** to begin the blank run.

8. When the blank run has finished, the following dialog is displayed:



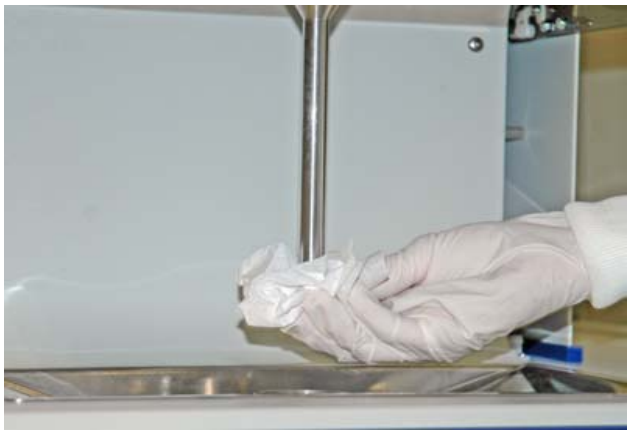
9. Perform the following steps:

   a. Open the sample shield.
   b. Pour the reference material into the sample chamber.
   c. Wipe the piston tip with a Kimwipe or paper towel.
   d. Close the sample shield and press **Reset**.
   e. Click **OK** on the Load Sample dialog to begin the reference run.

10. When the analysis has completed, the **Start** push button on the dialog changes to **Next**; Click **Next** to return to the original view of the Analysis dialog.

11. Perform the following steps:

    a. Open the sample shield.
    b. Wipe the piston tip with a Kimwipe or paper towel.



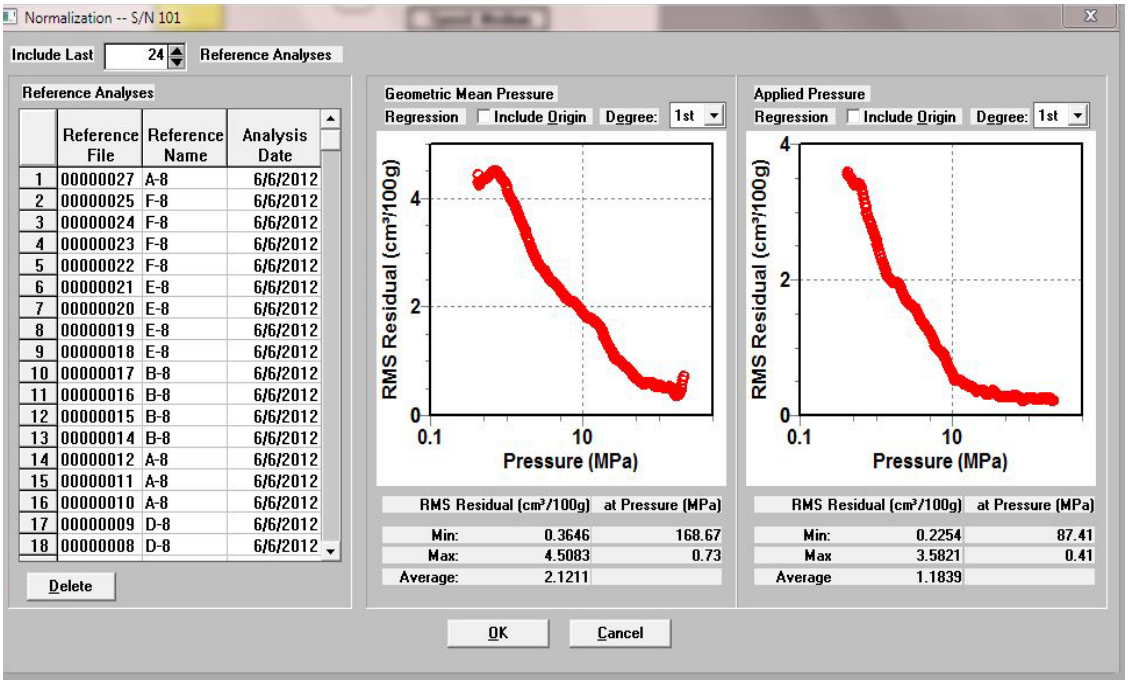
    d. Close the sample shield and press **Reset**.

12. Complete steps 1 through 10 for all reference materials.

Verifying Normalization Results

The current reference sample analyses are compared to the original "master" reference analysis averages to determine by how much the current analysis has shifted from that average. The normalization routine calculates a set of polynomials to correct for that difference. What is shown in the Normalization window (see example below) is how well the software was able to determine the polynomials it will use to correct, or normalize, the collected data.

1. Select **Unit > Normalization**; the Normalization dialog is displayed.



2. Note the residual values displayed on the dialog.

10. ORDERING INFORMATION

Accessories and replacement parts for the DVVA II analyzer can be ordered using one of the following methods:

- Call our Customer Service Department at (770) 662-3636
- Access our web site at www.micromeritics.com
- Contact your local sales representative

When ordering, please use the information provided below to place your order:

Part Number	Item and Description
400-25808-00	Piston tip assembly, 1/2 in.
004-24046-01	Scale pan, for weighing sample
004-54617-00	Brush, for dusting any remaining sample from the sample container into the chamber
004-54010-00	Wrench, 3/8 x 7/16, open end
400-09805-00	Pellet removal tool
400-42810-00	Operator's manual

A. ERROR MESSAGES

Error messages for the DVVA II program are listed numerically. If the **Action** response instructs you to contact your service representative, record the error message and make backup copies of any files involved in the operation.

2200 and 2400 Series

2201- Cannot execute report subsystem.

Cause: Start Report failed to execute the report subsystem (which is a separate process).

Action: Restart the computer. If the problem persists, reinstall the application (this will not affect any of your sample files). If the problem continues, contact a Micromeritics service representative.

2401- FATAL ERROR: (error message).

Cause: An internal processing and/or hardware error has occurred.

Action: Contact your service representative if you continue to receive this error message.

2430- Error accessing file (file name), error code = (number).

Cause A: A computer or network problem occurred.

Action A: Check the performance of your computer devices or network.

Cause B: A software error occurred when the file was accessed.

Action B: Contact your service representative.

2431- Error writing file (file name), error code = (number).

Cause: The hard disk does not have enough space left to perform the operation.

Action: Copy files not used regularly from the hard disk to a diskette, CD, or network directory, delete them from the hard disk, and then try the operation again.

2432- Invalid response from MMI 'FILE_READ' request.

Cause: An internal processing and/or hardware error has occurred.

Action: Contact your service representative if you continue to receive this error message.

2433- New entries have been found in this directory. Refresh the directory information?

Cause: Several files (sample information or parameter files) have been added to this directory by some function other than the DVVA II program.

Action: Select **Yes** to update the directory information with data from each new file. This operation may take a minute.

Select **No** if you do not want to spend the time updating the directory information. This option may be feasible if a large number of files have been copied into the directory and you know the name of the file you wish to access.

2434- File (file name) — Subset # (number) wrote wrong amount of data.

Cause: An internal processing and/or hardware error has occurred.

Action: Contact your service representative if you continue to receive this error message.

2436- Path specification (path name) is invalid.

Cause: You entered an invalid path name and/or extension.

Action: Type a valid path name (including the proper extension) and press **Enter**.

2437- File (file name) does not exist.

Cause: You entered a file specification that does not exist.

Action: Enter an existing file specification or select a file name from the list box.

2438- Disk drive (letter): is inaccessible.

Cause: You entered an invalid path name and/or extension.

Action: Type a valid path name (including the proper extension), and press **Enter**.

2439- Could not register file.
2440- Subset not found.
2441- Seek within file failed.
2442- Bad header in subset file.
2443- Subset owner denied access.
2444- Not a valid file format.
2445- Subset wrote the wrong amount of data.
2446- Error reading data.
2447- Error writing data.

Cause: An unexpected error occurred when you tried to access a data file.

Action: Contact your service representative.

2448- File directory (path name) is invalid. Resetting to the installation directory.

Cause: A working directory specified in the .INI file is invalid. The directory may have been deleted or moved to a different location.

Action: The installation directory will be substituted. The next time you open a file, use the **Directories** list to move to the correct directory.

2449- This field does not contain a valid file specification.

Cause: You entered an invalid file name.

Action: See the description of file naming conventions in your Windows manual and re-enter the name.

2450- Sample Defaults may not be edited while this operation is in progress. Do you wish to save and close the Sample Defaults edit session?

Cause: You are in the process of initiating an automatic analysis (an analysis in which sample files are created using the defaults) while editing the defaults.

Action: Finish your edit session of the defaults and close the dialog. Then restart the automatic analysis.

2452- Attempt to write MICATTR.DIR in read only mode. (file name)
2453- Attempt to append MICATTR.DIR in read only mode. (file name)

Cause: The Read-Only attribute is turned on in the application's MICATTR.DIR file (this file exists in each folder containing sample or parameter files).

Action: Use Windows Explorer to access the folder containing the MICATTR.DIR file and disable the Read-Only option.

2454- Too many selections for a print-to-file operation. Only the first (number) selections will be processed. Please reselect the remainder.

2455- Too many selections for an export-to-file operation. Only the first (number) selections will be processed. Please reselect the remainder.

Cause: You selected too many files for this operation.

Action: Select only the number of files specified in the message.

2456- Insufficient file handles available. Application cannot continue.

Cause: You have more than 50 files open at the same time.

Action: Refer to the manual for your operating system and set the limit for open files to 50 or greater.

2457- Results cannot be displayed. More than (number) windows are currently displaying or printing results.

Cause: You have too many windows open in the application.

Action: Close some of the open windows.

2458- An instrument is performing a critical operation. Wait a few moments before exiting the application.

Cause: You attempted to exit the application while the analyzer is performing a critical operation. This operation must be completed before the application can be stopped.

Action: Wait a few minutes before attempting to exit the application again.

2459- An instrument is busy. A delay in restarting this application could result in loss of new data. Continue with program Exit?

Cause: You attempted to exit the application while the analyzer was performing an operation.

Action: Rather than exiting the application you may choose to minimize it.

2460- Fatal Communications error on (unit nn).

Cause: Repeated attempts to maintain communication with the analyzer have failed.

Action: Check the communications cable connecting the analyzer to the computer. Confirm that the analyzer is turned on and that the Ready indicator is illuminated.

If these checks are okay, exit the analysis program and then restart the application. If this error persists, contact your service representative.

2461- No instruments are in operation. This application will unconditionally terminate.

Cause: The initialization of the analyzer configured with the Set Up program has failed. The application stops.

Action A: Usually this message is preceded by another message giving the reason for the analyzer's failure to initialize. See the instructions for that message.

Action B: Check the cable connection between the analyzer and the computer. Verify that the analyzer has the power switch in the ON position and that the light on the front panel is illuminated. If the application continues to fail in its attempts to initialize the analyzer, contact your service representative.

2480- File (file name) cannot be analyzed. It is currently being edited.

Cause: You attempted an analysis using a sample file that is being edited.

Action: Save the changes and close the dialog.

2481- Error accessing the sample information file (file name).

Cause A: You attempted to open a file that is already open, possibly minimized.

Action A: View the minimized icons, locate and maximize the file.

Cause B: A computer or network problem occurred.

Action B: Check the performance of your computer devices or network.

Cause C: A software error occurred when the file was accessed.

Action C: Contact your service representative.

2482- File cannot be opened for writing. It is already in use.

Cause: You are attempting to open a file that is currently being used (either by this application or another).

Action: Locate the application using the file (in the Micromeritics application, use the Windows menu item to get a list of all windows, one of which may contain this file).

2483- An analysis cannot be performed on (file name). It is open for editing and contains errors.

Cause: You attempted to use a sample file containing errors that is currently open.

Action: Go to the window containing the file, correct the errors, and save it.

2484- The edit session for (file name) must be saved before the analysis. Save changes and continue with the analysis.

Cause: You attempted an analysis using a sample file that contains unsaved changes.

Action: Select **Yes** to save the changes and continue with the analysis.

Select **No** to abort the analysis and return to the sample file.

2486- Cannot construct (name) report type. Program will terminate.

2487- Cannot start report generator. Error code (number). Program will terminate.

Cause A: You may not have full rights to the applications's folders and files.

Cause A: You may not have full rights to the applications's folders and files.

Action B: An internal processing and/or hardware error has occurred.

Action A: Contact your service representative if you continue to receive this error.

2488- File (file name) cannot be opened for editing. It is already in use.

Cause: The file you specified is being used in another edit operation.

Action: Check the Windows list to locate the other edit session.

2489- File (file name) cannot be opened for writing. It is already in use.

Cause: The file you specified in a **Save As** operation is already open for edit.

Action: Select a different file for the **Save As** operation.

2490- No '.INI' file present. Application will terminate.

Cause: The ASCII (.INI) file containing initialization and system options information cannot be found. The .INI file may have become corrupted. The application cannot operate without this file.

Action: Use the Set Up CD to uninstall the analysis program. When you uninstall the program, only application files are deleted; data files remain intact.

After the uninstall operation is complete, reinstall the program.

2492- This field's entry is invalid.

Cause: The highlighted field contains an invalid entry.

Action: Check the entry and correct the error.

2493- An entry is required for this field.

Cause: This field requires a valid entry for you to proceed.

Action: Enter or select an appropriate value.

2494- Value is out of the valid range.
2495- Value is out of the valid range. Enter a value between (value) and (value).

Cause: The value you entered in the highlighted field is outside the valid range of values.

Action: Check the entry and enter or select an appropriate value.

2496- Invalid number.

Cause: The number you entered in the highlighted field is invalid.

Action: Check the entry and enter or select a valid number.

2497- This field contains an invalid character.

Cause: You entered an invalid character in the highlighted field.

Action: Check the entry and enter valid characters.

2499- Sequence number must contain at least 3 digits.

Cause: You tried to enter a sequence number that did not contain at least three digits.

Action: Enter a sequence number that contains at least three digits.

2500 Series

2500- All sample file names that can be created using the sequence number pattern already exist. You may want to modify the next sequence number.

Cause: No more sample information files can be created using the currently entered file name sequence number.

Action: Select **Options** > **Sample Defaults** from the Main Menu and enter a new sequence number.

2501- System resources have reached a dangerously low level. Please close some windows to avoid the loss of data.

Cause: A large number of windows is open and consuming the system resources available to all applications.

Action: Close one or more windows. Contact your service representative if you continue to receive this message.

2502- Error writing to file (name) during print. Error code: (number).

Cause: An error occurred in the file being written to during a print operation.

Action: Ensure that there is sufficient space on the drive containing the file.

2504- Cannot create output file for sample (sample name).

Cause: Insufficient space may be available on the hard disk.

Action: Ensure that sufficient space is available. Contact your service representative if you continue to receive this error message.

2505- Error Logger cannot be initialized! Error code (number). Program will exit.

Cause: An internal processing and/or hardware error has occurred.

Action: Contact your service representative.

2506- (sample file) Output device (name) is not installed. Printing cannot be accomplished.

Cause: The selected output device is not installed in Windows.

Action: Install the device using the **Control Panel** > **Printers** operation.

2508- (sample file) Overlay file (name) was not found. It will not be included in the reports.

Cause: The specified overlay file could not be found.

Action: Ensure that the file specified as an overlay does exist.

2509- (sample file) Error opening file (name): (error). Reports cannot be produced.

Cause: An error occurred while the program was opening a file necessary to the report operation.

Action: Use the name given in the error message to investigate. Contact your service representative if you continue to receive this error message.

2510- (sample file) Error parsing reports from file (name). Reports cannot be produced.

Cause A: One or more data entry fields in the sample file may contain an invalid character (such as a single quote or double quotes).

Action A: Review the data entry fields (for example, the **Sample** field) and remove the invalid character.

Cause B: The system was unable to create the usual temporary files during the report, possibly due to insufficient disk space.

Action B: Check the space available on the hard disk.

Cause C: An internal processing error occurred.

Action C: Contact your service representative.

2511- Print job (name) has been cancelled due to insufficient disk space. Delete unnecessary files and restart the report.

Cause: The disk drive does not have enough space for the temporary file required by the Windows Print Manager. Therefore, printing of the requested report has been canceled.

Action: Delete unnecessary files from the disk. You will require at least five megabytes of free space for normal operation.

2512- Print job (name) has been cancelled.

Cause: The requested print job was canceled at your request.

Action: None required.

2513- Unable to read the calibration file (file name).

Cause: You selected an invalid calibration file or one that cannot be read.

Action: Be sure the media containing the calibration file has no problems.

2514- Unable to write the calibration file (file name).

Cause: An attempt to Save calibration data has failed due to possible media problems.

Action A: Be sure the media you want to Save the file to has no problems.

Action B: Choose an alternate media to Save the calibration data.

2515- Warning: Changing the calibration information will affect the performance of the instrument. Only qualified service personnel should do this. Do you wish to proceed?

Cause: You have started the process of performing a calibration operation.

Action: Calibration operations should only be done by, or under the direction of, qualified service personnel.

2521- Unable to program controller.

Cause: A hardware malfunction has occurred.

Action: Contact your local Micromeritics service representative.

2522- Invalid controller application file.

Cause: The application's control file has been corrupted or deleted.

Action: Reinstall the analysis program.

2523- Programming the controller failed.
2524- CRC check failed on programming controller.
2525- Unknown error programming controller.
2526- Controller download was not successful.

Cause: An internal processing and/or hardware error has occurred.

Action: Contact your service representative if you continue to receive this error message.

2532- The instrument contains a different software version. Do you want to reset it?

Cause: The application has discovered a different version of software operating in the analyzer.

Action: If there are no analyzers other than the DVVA connected to the computer, select **Yes** and allow the updated software to load.

2533- Analyzer initialization failed.

Cause: An internal processing and/or hardware error has occurred.

Action: Contact your service representative if you continue to receive this error message.

2534- Error opening file (name) for printing. Error code: (number).

Cause: An error occurred in the selected file for print output.

Action: Ensure that sufficient space is available on the drive containing the file.

2547- The instrument is busy. Exiting the application will result in the termination of the analysis. Continue with program exit? (Yes, No)

Cause: You attempted to exit the application while an analysis is in progress.

Action: If you are not concerned with cancellation of the analysis, click **Yes** to continue the exit; otherwise select **No** and allow the analysis to finish.

2549- Error accessing online manual file (name).

Cause: You were unable to open the online manual.

Action: Exit the application and reinstall the software. The manual and/or reader may have been accidentally deleted. Reinstalling the software will reinstall the manual and reader.

6000 Series

6000- An error occurred while loading the application control information. Data entry cannot be performed. (Code n)

Cause: The control information disk file required by this application could not be found.

Action A: The disk drive may have failed or be corrupted. Run diagnostics on the disk drive.

Action B: Contact your service representative.

6001- Error accessing the sample information file (file name). (Code n).

Cause A: You attempted to open a file that is already open, possibly minimized.

Action A: View the minimized icons, locate and maximize the file.

Cause B: A computer or network problem occurred.

Action B: Check the performance of your computer devices or network.

Cause C: A software error occurred when the file was accessed.

Action C: Contact your service representative.

6002- File (file name) cannot be analyzed. It is currently being edited.

Cause: You selected a file for analysis that is still open in an editing window.

This is an information-only message and displays when you click **No** to message 6005.

Action: Click **OK** to close the dialog. Then, either continue editing the file, save and close it; or click **Browse** and choose a different file for your analysis.

6003- File (file name) cannot be opened. It is currently being setup for an analysis.

Cause: You attempted to open a file that is currently being used in an analysis.

Action: Select a different file.

6004 An analysis cannot be performed on (file name). It is open for editing and contains errors.

Cause: You attempted to start an analysis using a file that contains errors and is open for editing.

Action A: Finish editing the file, save, and close it, or choose a different file. Then restart the analysis.

6005- The edit session for (file name) must be saved before the analysis. Save changes and continue with the analysis?

Cause: You attempted to start an analysis using a file that contains unsaved changes and is still open.

Action: Click **Yes** to save the changes and proceed with the analysis.

Click **No** to cancel the analysis and (1) continue editing the file, save and close it; or (2) click **Browse** and choose a different file.

6006- At least one report item must be selected. Press Cancel if you do not want a report.

Cause: You failed to select reports in the **Selected Reports** list window. No output could be produced.

Action: Ensure that at least one report is selected for the sample and re-submit the sample for reporting, or click **Cancel**.

6007- No data available in file (file name) for reporting.

Cause: You requested a report for a file that does not contain collected data.

Action: Choose a file that contains collected data (**Complete** status).

6017- Lower piston motor failure.

Cause: The lower piston cannot drive to the requested position.

Action: Contact your service representative.

6018- The lower piston cannot be moved because it is under load. Relieve the pressure on the lower piston and try again.

Cause: You attempted to move the lower piston but its load is too high.

Action: Raise the upper piston so that it is not pressing against the lower one.

6019- The lower piston cannot be moved because the upper piston is too low. Raise the upper piston into the chamber and try again.

Cause: The lower piston will not move because the upper piston tip is too low.

Action: Raise the upper piston above 0.025 inch to allow the lower piston to move.

6020- The upper piston cannot be moved down with the lower piston in its current position. The upper piston will only move down when the lower piston is either fully open or fully closed.

Cause: You attempted to move the upper piston when the lower piston was not in the correct position.

Action: Open or close the lower piston completely. The lower piston must be fully open or completely closed for the piston to move.

6021 The Zero Height calibration failed. Please check that the chamber is empty, and the piston tip is clean and undamaged and repeat the calibration.

Cause: The upper piston tip is damaged.

Action: Replace the upper piston tip, then repeat the calibration.

Cause: The upper piston tip contains sample or debris.

Action: Select **Unit > Clean System** to clean the system, then repeat the calibration.

6022- Analysis cancelled. The instrument zero height is out of specification. Please check that the sample tray is in place, the chamber is empty, and the piston tips are clean and undamaged.

Cause A: The chamber was not empty for the blank analysis.

Action A: Repeat the analysis starting with a clean, empty chamber. Do not load sample until prompted to do so.

Cause B: A piston tip is damaged or very dirty.

Action B: Clean or replace the piston tip.

Cause C: Your instrument may need servicing.

Action C: Contact your service representative.

6023- The Height Scale calibration failed. Please check that the chamber contains only the calibration standard, that the length of the standard was entered correctly, and that the piston tips are clean and undamaged.

Cause A: The sample chamber contains sample or debris.

Action A: Select **Unit > Clean System** to clean the system; then load the calibration standard and repeat the calibration.

Cause B: The length of the calibration standard was not entered correctly.

Action B: Enter the length stamped on the calibration standard.

Cause C: A piston tip is damaged or very dirty.

Action C: Clean or replace the piston tip.

6024- Unable to drive upper piston. Check the condition and contents of the chamber, and that the instrument is enabled.

Cause A: Debris is in the chamber.

Action A: Select **Unit > Clean System** to clean the system. The chamber should be empty for the blank analysis. Do not load the sample until prompted to do so.

Cause B: One of the safety interlocks was triggered.

Action B: Ensure that the safety shield for the sample compartment is completely down, and that the front drawer is completely closed. Then press the **Reset** button.

Turn the red **Emergency Stop** button clockwise to reset it, then press the **Reset** button.

6025- Unable to reach the requested ending pressure.

Cause: The instrument could not build pressure to the endpoint specified in the Analysis Conditions dialog.

Action: Check that the ending pressure in the analysis conditions is within the specification for your instrument. If it is, then call your service representative.

6026- The instrument is currently disabled. Ensure that the shield is down and the drawer closed, and press the instrument reset button.

6027- Instrument fault.

Cause: One of the safety interlocks was triggered.

Action A: Ensure that the safety shield for the sample compartment is completely down, and that the disposal drawer is completely closed. Then press the **Reset** button.

Action B: Turn the red **Emergency Stop** button clockwise to reset it, then press the **Reset** button.

6028- The sample file has an invalid status and cannot be used for analysis.

Cause: You selected a sample file with a status other than **No Analysis**.

Action: Select a sample file that has not been used in an analysis.

6029- Application restarted during an analysis. Analysis canceled.

Cause: You exited the application during an analysis and when you restarted the application, the analysis had been canceled.

Action: None required. The data collected up to the point of cancellation will be saved in the sample file.

6030- Unable to read the calibration file (file name).

Cause: You selected an invalid calibration file or one that cannot be read.

Action: Be sure the media containing the calibration file has no problems.

6031- Unable to write the calibration file (file name).

Cause: An attempt to Save calibration data has failed due to possible media problems.

Action A: Confirm the media containing the calibration file has no problems.

Action B: Choose an alternate media to Save the calibration data.

6032- File contains calibration data for a different unit (S/N: nnn).

Cause: You loaded a calibration file that was created for a different unit.

Action A: Load a file that was created for the current unit.

Action B: Contact your service representative for assistance in calibration.

6035- Analysis cancelled because there is not enough data for a blank correction. Decrease the Recording Interval, increase the Ending Pressure, and/or decrease the Scan Rate.

Cause: The combination of values you entered for the **Scan Rate**, **Ending Pressure**, and **Recording Interval** does not yield enough data for a stable blank correction.

Action: Access the Analysis Conditions dialog and do one or more of the following:

- Decrease the Recording Interval
- Increase the Ending Pressure
- Decrease the Scan Rate
- Ensure that Use Prior Blank is not selected

6036- Force calibration failed.

Cause A: If this occurs during the **Upper Force Scale** calibration, the external reference load cell is not working properly.

Action A: Make sure the reference load cell has been tared properly and is displaying the correct units.

Cause B: If this occurs during the **Lower Force Scale** calibration, the upper load cell is calibrated properly.

Action B: Make sure the reference load cell has been tared properly and is displaying the correct units.

Cause C: Instrument failure.

Action C: Contact your service representative.

6037- Possible piston tip failure. Check that the chamber is empty and the tip is clean. If so, replace the piston tip.

Cause A: Sample was in the chamber when the blank analysis was performed.

Action A: Select **Unit > Clean System**, then retry the analysis. Do not load sample until prompted to do so.

Cause B: The upper piston tip is dirty.

Action B: Thoroughly clean the upper piston tip with a Kimwipe and retry the analysis.

Cause C: The upper piston tip has failed.

Action C: Replace the piston tip; refer to **Replacing and Conditioning the Piston Tip**, page **9-19**.

6039- Data Acquisition error.

Cause A: Network activity is interfering with communication.

Action A: Close programs that use the network and disconnect and shared drives.

Cause B: You had other applications open while analysis data were being collected.

Action B: Close all other applications when performing an analysis.

Cause C: A scheduled update was being performed while analysis data were being collected.

ActionC: Schedule automatic updates during a time when analyses are not being performed; for example, during non-working hours.

Cause D: The hardware configuration of the computer was changed during analysis.

Action D: Do not add or remove devices such as USB drives during analysis.

6041- Not enough data collected in file (file name) for reporting.

Cause: You requested a report for a file that does not contain collected data.

Action: Choose a file that contains collected data (**Complete** status).

6044- Use Prior Blank selected, but a prior blank could not be found.

6050- The lower piston did not successfully set the home position.

Cause A: There was an obstruction in the lower piston path when the tray loading position was being set.

Action A: Open the tray drawer and repeat the sample tray.

Cause B: The lower piston drive assembly is damaged.

Action B: Contact your service representative.

6051- Analysis cancelled. The difference between upper and lower load cell readings is too high. Check that the sample tray is in place.

Cause A: The sample tray containing the lower piston was not in place when the analysis was started.

Action A: Lower the lower piston, open the tray drawer, and install the sample tray.

Cause B: The upper or lower piston does not have a proper calibration.

Action B: Contact your service representative.

5952- Analysis cancelled. The upper piston has reached the minimum allowed height. Check that the sample tray is in place.

Cause A: The sample tray containing the lower piston was not in place when the analysis was started.

Action A: Lower the lower piston, open the tray drawer, and install the sample tray.

Cause B: The linear transducer does not have a proper calibration.

Action B: Contact your service representative.

B. CALCULATIONS

This appendix contains the calculations used in calibrations and in reports available in the DVVA II 4000 program.

Calibration

The force as a function of load cell voltage is found by a two-point linear calibration. One point (F_1, V_1) is measured with no applied force, so $F_1 = 0$. The other (F_2, V_2) is measured with an applied force.

$$F = F_2 \frac{V - V_1}{V_2 - V_1}$$

The piston height as a function of linear transducer voltage is also found by a two-point linear calibration. One point (h_1, V_1) is measured with an empty chamber, so $h_1 = 0$. The other (h_2, V_2) is measured with a reference standard of known height (h_2) in the sample chamber.

$$h = h_2 \frac{V - V_1}{V_2 - V_1}$$

where

F = measured force
V = voltage
h = measured height

Blank Correction

A blank analysis is performed to correct for the frictional force between the piston and the sample chamber, and for the deflection of the linear transducer.

$$F_S = F - F_f(h_b)$$

$$h_b = h - h_d(F)$$

where

F = applied force
F_S = force on sample
F_f = frictional force
h_b = bed height
h = measured height
h_d = deflection

Void Volume

$$VV(F_S) = (V_A(F_S) - V_T) \times 100$$

$$V_A(F_S) = h_b A$$

$$A = \frac{\pi d^2}{4}$$

$$V_T = \frac{m}{\rho_S}$$

where

V_A = apparent volume
F_s = force of sample
h_b = bed height
m = mass
ρ_S = skeletal density
d = diameter of sample chamber

Compaction Equations

General Terms

V_T (sometimes V_0) = Bulk or Initial Volume. (Mass)/(Bulk Density, ρ_β).

V_S = Volume of Solids, (Mass)/(skeletal density, ρ_s).

V_v = Volume of the voids = V_T - V_S.

$$\text{Void Ratio} = e = \frac{V_V}{V_S} + \frac{V_T - V_S}{V_S} = \frac{\rho_S}{\rho_\beta} - 1$$

$$\text{Porosity} = n = \frac{V_V}{V_T} = \frac{V_T - V_S}{V_T} = 1 - \frac{\rho_\beta}{\rho_S}$$

Kawakita

The Kawakita is given by:

$$\frac{P}{C} = \frac{1}{ab} + \frac{P}{a}$$

where

P = applied pressure
C = relative volume decrease, $\frac{V_0 - V}{V_0}$
a, b = material characteristic constants derived from a linear fit of $\frac{P}{C}$ *vs* P
V_0 = initial volume
V = volume at pressure P

Bauer

The Bauer equation is given by:

$$e = e_0 \cdot \exp\left(-\left(\frac{3P}{a}\right)^b\right)$$

where

e = void ratio, $\frac{V_v}{V_S}$
e_0 = void ratio at P=0
P = applied pressure
a = granulate hardness parameter with units of pressure
b = dimensionless stiffness parameter between 0.3 (spherical grains) and 0.1 (angular grains)
V_V = volume of the voids
V_S = volume of the solids

Cooper Eaton

The Cooper-Eaton equation is given by:

$$\frac{V_0 - V}{V_0 - V_S} = a_1 \exp\left(-\frac{b_1}{P}\right) + a_2 \exp\left(-\frac{b_2}{P}\right)$$

where

V_0 = volume at P=0
V = volume at P
V_S = volume of the solid sample
P = applied pressure
a_1 a_2 = material characteristic constants
b_1 b_2 = material characteristic constants

The terms on the right-hand side of the equation relate to the processes of particle rearrangement and particle deformation. The constants b_1 and b_2 represent the pressures required to induce compaction due to those processes, while a_1 and b_2 indicate the relative magnitude of each process.

Modified Heckel

The Modified Heckel equation is given by:

$$\ln\left(\frac{1}{1-D}\right) = aP^b + c$$

where

P = applied pressure
D = relative density

a, b, and c = material characteristic constants derived from a nonlinear fit of the equation.

The pore fraction (1-D) is equal to the void ratio $\frac{V_V}{V_S}$, which is the ratio of the volume of the voids V_v to the volume of the solid sample V_S. Also called the porosity.

The Heckel* equation is the solution to a first order reaction, $\frac{dD}{dP} = k(1 - D)$ where the rate constant, *k*, is equal to $a \cdot b \cdot P^{b-1}$. The standard Heckel equation results from setting the exponent *b* to unity.

Wu

The Wu equation is given by:

$$\frac{1}{e} = \frac{1}{e_0} + aP^b$$

where

e = void ratio V_v/V_S
e_0 = void ratio at P=0
P = applied pressure
a, b = constants

References

The Kawakita, Heckel, and Cooper-Eaton equations are discussed in the following:

1. Kmio Kawakita and Yuhbun Tsutsumi, "A Comparison of Equations for Powder Compression," *Bulletin of the Chemical Society of Japan*, 39, 1364-1368 (1966).

2. Patel and Patel, "Overview of Phenomenological Equations for Powder Compaction Study," *International Journal of Pharmaceutical Research*, 1(1), 2-15 (2009).

3. Tansel Comoglu, "An Overview of Compaction Equations," *Ankara Ecz. Fak. Derg. J. Fac, Pharm, Ankara*, 36(2), 123-133 (2007).

The Bauer and Wu equations are discussed in:

4. D. Kolymbas, *Constitutive Modelling of Granular Materials*, Springer (1999).

C. BULK DENSITY FOR CARBON BLACK

Listed below are the bulk densities for the SRB series reference materials.

Series 8 (current)

Reference Name	Bulk Density
A-8 Tread/Hard	0.41
B-8 Tread/Hard	0.31
C-8 Tread/Hard	0.29
D-8 Carcass/Soft	0.64
E-8 Carcass/Soft	0.44
F-8 Carcass/Soft	0.34

Series 7

Reference Name	Bulk Density
A-7 Tread/Hard	0.44
B-7 Tread/Hard	0.32
C-7 Tread/Hard	0.30
D-7 Carcass/Soft	0.65
E-7 Carcass/Soft	0.43
F-7 Carcass/Soft	0.31

Series 6

Reference Name	Bulk Density
A-6 Tread/Hard	0.31
B-6 Tread/Hard	0.34
C-6 Tread/Hard	0.46
D-6 Carcass/Soft	0.48
E-6 Carcass/Soft	0.44
F-6 Carcass/Soft	0.32

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