



# **SediGraph<sup>®</sup> III 5120**

**Operator's Manual**

**Rev L**

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## Organization of the Manual

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This manual describes the proper installation and operation of the SediGraph 5120 Particle Size Analysis System. It is organized so that all procedures are conveniently located in Chapter 3. Chapters 5, 6, 7, and 8 are reference chapters should you need additional information while performing these procedures.

This manual is organized as follows:

- |                   |   |
|-------------------|---|
| <b>Chapter 1</b>  | <b>GENERAL INFORMATION</b>  |
|                   | Provides a general description of the SediGraph 5120 analysis system, its features and specifications.  |
| <b>Chapter 2</b>  | <b>USER INTERFACE</b>   |
|                   | Provides a description of the controls and indicators on the analyzer and provides general information about using the 5120 application software. |
| <b>Chapter 3</b>  | <b>OPERATIONAL PROCEDURES</b>   |
|                   | Provides procedures for the operations performed with the SediGraph 5120.   |
| <b>Chapter 4</b>  | <b>SOFTWARE AND SETUP MODIFICATIONS</b>   |
|                   | Provides procedures for installing 5120 application software updates and for modifying the application setup.                                     |
| <b>Chapter 5</b>  | <b>FILE MENU</b>  |
|                   | Provides a description of the options contained on the File menu.   |
| <b>Chapter 6</b>  | <b>UNIT MENU</b>  |
|                   | Provides a description of the options contained on the Unit menu.   |
| <b>Chapter 7</b>  | <b>REPORTS MENU</b>   |
|                   | Provides a description of the options contained on the Reports menu.  |
| <b>Chapter 8</b>  | <b>OPTIONS MENU</b>   |
|                   | Provides a description of the options contained on the Options menu.  |
| <b>Chapter 9</b>  | <b>TROUBLESHOOTING AND MAINTENANCE</b>  |
|                   | Provides user maintenance and service information.  |
| <b>Chapter 10</b> | <b>ORDERING INFORMATION</b>   |
|                   | Provides ordering information for the SediGraph system components.  |

<b>Appendix A</b>	<b>ERROR MESSAGES</b>	Lists the error messages displayed by the SediGraph 5120 analysis program; includes a cause and action for each.
<b>Appendix B</b>	<b>SAMPLE DISPERSION</b>	Provides methods for dispersing samples.
<b>Appendix C</b>	<b>CHEMICAL AIDS FOR PARTICLE DISPERSION</b>	Provides a list of dispersants and their active ingredients.
<b>Appendix D</b>	<b>STOKES' LAW</b>	Provides calculations for Stokes' Law.
<b>Appendix E</b>	<b>SEDIMENTATION THEORY</b>	Provides theoretical information on the sedimentation method.
<b>Appendix F</b>	<b>SEDIGRAPH RESULTS RELATIVE TO OTHER METHODS</b>	Provides the relativity of SediGraph results to other methods.
<b>Appendix G</b>	<b>LIQUID DENSITY AND VISCOSITY DATA</b>	Provides density and viscosity data for common dispersants.
<b>Appendix H</b>	<b>SOURCES OF DISPERSING AIDS</b>	Provides a list of suppliers for common dispersants.
<b>Appendix I</b>	<b>SEDISPERSE PARTICLE DISPERSION LIQUIDS</b>	Provides information on Sedisperse dispersing liquids.
<b>Appendix J</b>	<b>DATA REDUCTION</b>	Contains the calculations used for producing reports.
<b>Appendix K</b>	<b>SEDIGRAPH X-RAY SAFETY INFORMATION</b>	Describes the safety features provided with the SediGraph 5120.
<b>Appendix L</b>	<b>MASTERTECH INSTALLATION</b>	Describes how to install a MasterTech for use with the SediGraph.
<b>Index</b>	<b>INDEX</b>	Provides quick access to subject matter.



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# Conventions

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## Symbols

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This document uses the symbols shown below to identify notes of importance, cautions, and warnings.



**Notes contain a tip or important information pertinent to the subject matter.**



**Cautions contain information to help you prevent actions which could damage the instrument.**



**Warnings contain information to help you prevent actions which could cause personal injury.**

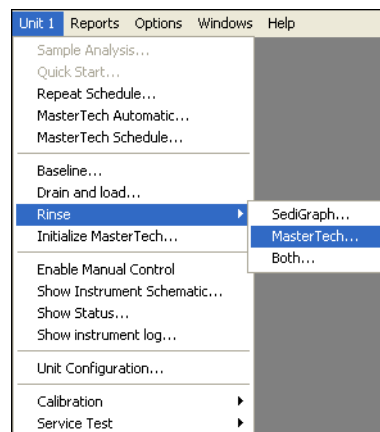
## Commands

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### Menu Commands

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Menu commands are the commands selected from the main menu and its submenus.



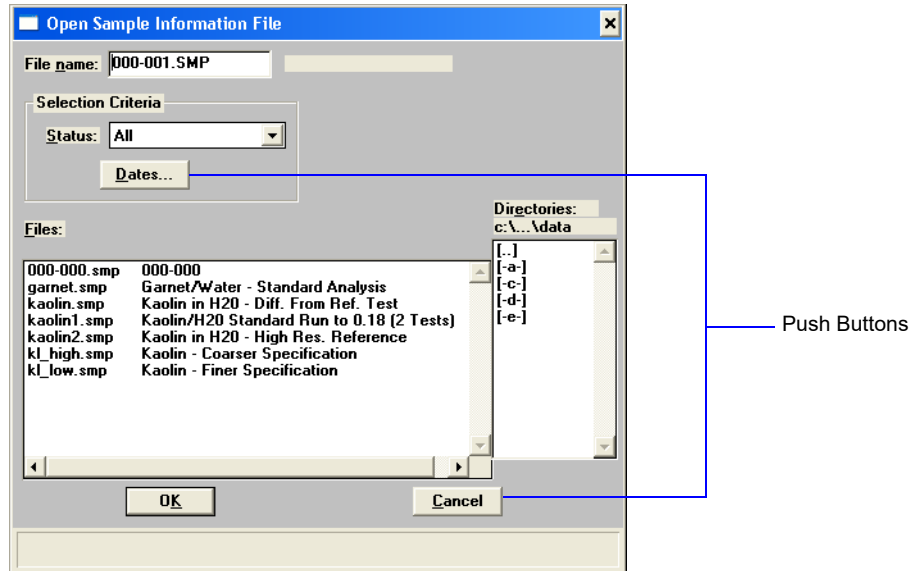
Menu commands are represented in this manual as shown in the following example:

- Select **Unit1 > Rinse > MasterTech**.

Which means, select **Unit1** from the main menu, select **Rinse** from the Unit 1 menu, then select **MasterTech** from the Rinse submenu.

## Push Buttons

The dialog boxes contain buttons, referred to as *push buttons*, which execute a command or display another dialog. For example, the **Cancel** button cancels any entries you made in the dialog.



In this manual, push buttons are represented by the bold type font shown in the following example:

Select **Dates** to enter a range of dates to be included in the selection criteria.

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## Equipment Description

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### SediGraph 5120

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The SediGraph 5120 Particle Size Analysis System consists of up to two particle size analyzers, and a multi-function computer. The particle size analyzer is mounted on adjustable feet and contains a level indicator so that accuracy of the analysis process is maintained. It is designed for completely automatic operation; however, a sliding transparent door on the front panel provides convenient observation of, and access to, the temperature-controlled analysis compartment.

The SediGraph contains an internal fixed-position X-ray source, detector assembly, and a vertical cell movement assembly. It incorporates a complete system for circulation of sedimentation liquid and particle sample mixture between the cell, the external mixing chamber, an external rinse liquid container, and an external waste container. It also contains a detachable magnetic stirring assembly.



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## MasterTech 052

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The MasterTech 052, an automatic sampling device that operates in conjunction with the SediGraph 5120, is also available. The MasterTech allows you to “queue up” as many as 18 predispersed samples to run consecutively and unattended. It allows samples to be redispersed either by stirring only or by stirring and disruption with an ultrasonic probe. The MasterTech transfers each sample to the SediGraph, then after analysis is complete, rinses the mixing chamber, the connecting tubing, and the stirrer.

The MasterTech 052 consists of three main components: the arm assembly, the body, and the beaker tray. The arm assembly controls the movement of the stirring rotor, the ultrasonic probe, and the transfer tube. The body houses the electronics, the transfer pump, the front panel controls, and supports the beaker tray, which holds up to 18 sample beakers.

During operation, the beaker tray is loaded with beakers containing 60 to 80 mL of predispersed sample. When the SediGraph is ready for a sample, the tray rotates until the correct sample is underneath the head of the arm assembly. The head then lowers until it rests on top of the beaker. Stirring action begins and continues for a user-specified length of time. If desired, the ultrasonic probe can be activated to aid in redispersion.

When redispersion is complete, the pump transfers most of the sample to the SediGraph, where it is loaded into the mixing chamber. Analysis now proceeds as if you had filled the mixing chamber manually with predispersed sample. When analysis is complete, the contents of the mixing chamber are disposed to the waste container, and a small amount of rinsing fluid is back-flushed to the MasterTech to rinse the tubing. The arm rises so that the rinse liquid removes the sample residue from the stirrer blades and transfer tube. Once rinsing is complete, the arm rises to the Up position. The MasterTech is now ready to proceed to the next sample.

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## Windows® Interface

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The SediGraph 5120 analysis program is designed to operate in the Windows environment. This makes operation of the SediGraph 5120 easier and allows you to run other applications while an automatic operation is in progress. If you are new to Windows, you should learn some basic Windows skills, such as using the mouse and choosing commands. Brief operating instructions are provided in [“Using the Software” on page 2-9](#). More specific instructions are provided by Windows in an online tutorial.

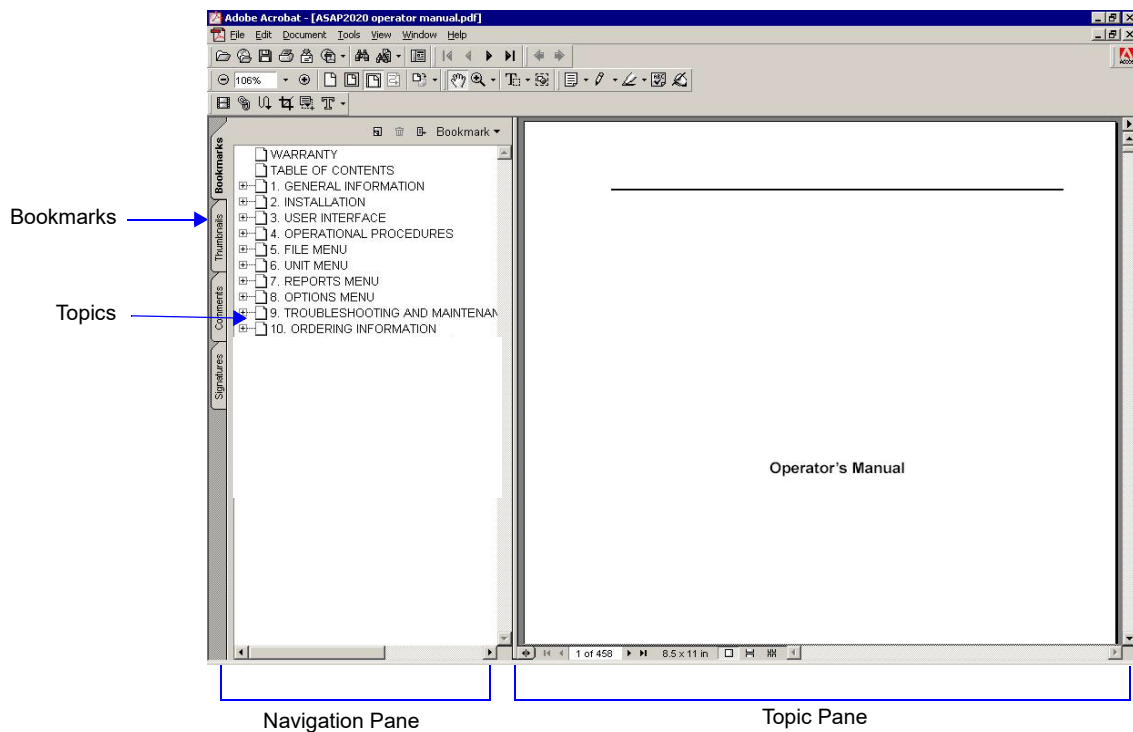
## Online Manual

For your convenience, the Operator's Manual is available online. You can access the manual by selecting **Help**, then **Operator's Manual** from the analysis program main menu. The manual appears in an Adobe® Acrobat® Reader®.

Following are some tips to help you quickly locate the information you need in the manual. Refer to the Adobe Acrobat Help system (click the **Help** button on the Acrobat menu) for more information on the Acrobat features you can use while viewing the manual.

### Using Bookmarks

Click the **Bookmarks** tab to list and access the topics included in the manual.



You can use the + and – buttons next to topics as they are used in Windows Explorer to expand or collapse the topic list.



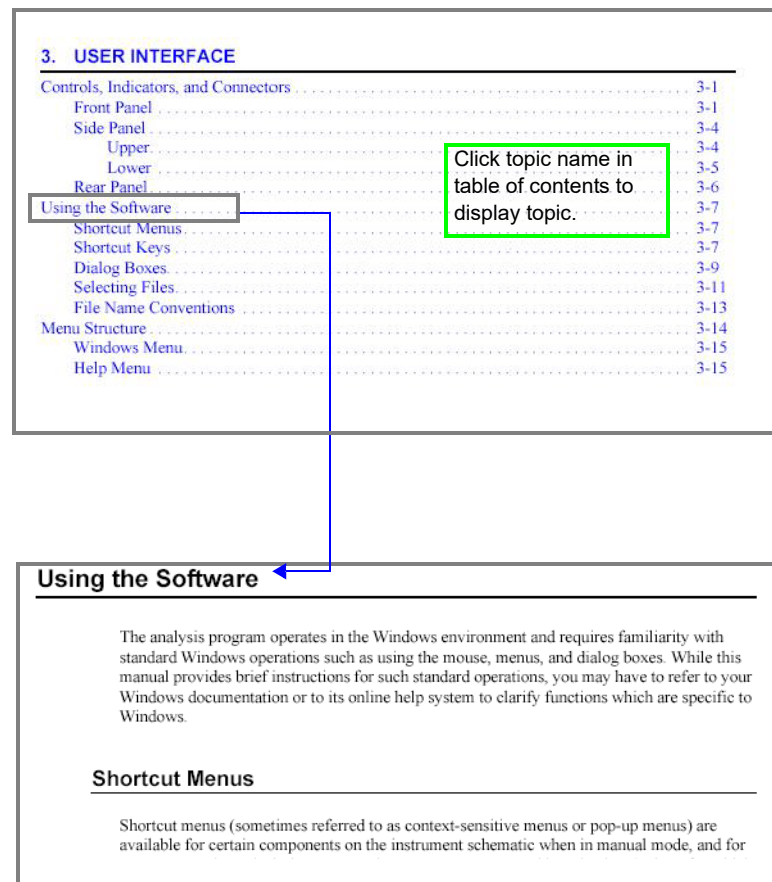
## Using the Table of Contents, Index, and other Links

Links provide direct access to selected information. All links appear in blue type. Links are contained in:

- the table of contents
- index entries
- cross-references within the manual

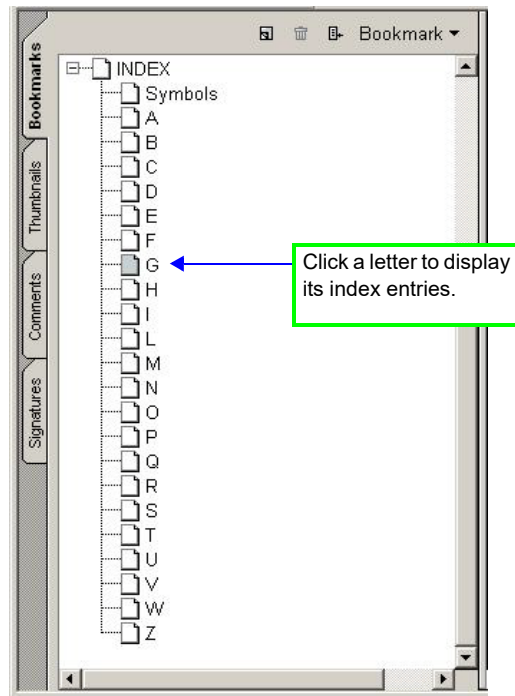
### Table of Contents

To display the table of contents, click **Table of Contents** in the **Bookmarks** section. When the table of contents is displayed, you can click an entry to display its associated page. For example, clicking **Using the Software** in the table of contents, displays the page containing information about the software.



## Index

To use the index in the online manual, click the **Bookmarks** tab, scroll down to **INDEX** (the last topic in Bookmarks), then click the + button to expand the index. The letters A through Z are displayed. Click a letter to display its corresponding index entries as shown in the following example.



After you display the entries, locate the item of interest and click on the page reference to access the information.

## Cross References

Cross-references work in the same manner. In the example below, clicking on the cross-reference, **FILE MENU** (shown on the screen in blue type) will display the first page of the chapter describing the commands found on the File menu.

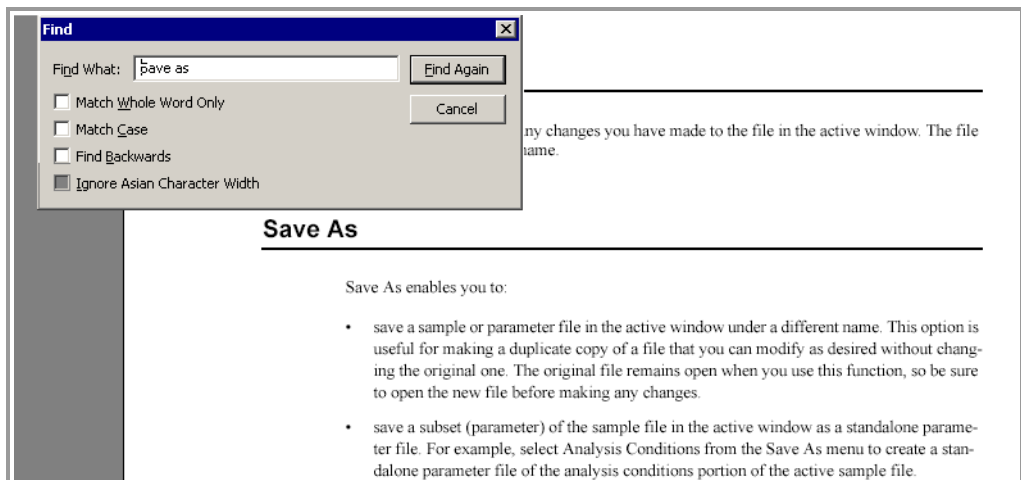
### **FILE MENU**

Provides a description of the commands available on the File menu.




## Using the Find Command

The Adobe Acrobat **Find** command provides another method of easily accessing specific information. For example, suppose you want to know how the **Save as** command works. You could select **Edit > Find** from the Adobe Acrobat menu, then enter **Save as** in the Find dialog. The following example shows the results.

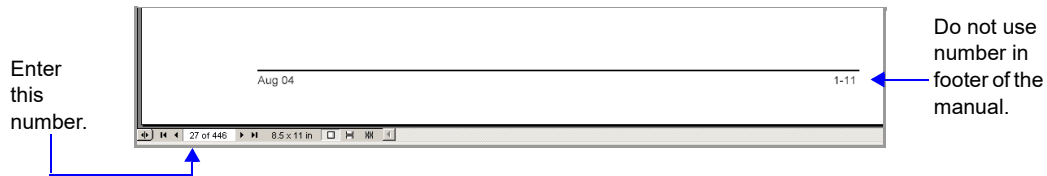


## Printing

You can print the entire manual, a selected page, or range of pages. There are several options for printing. You can:

- Select the printer icon (  ) on the Adobe Acrobat toolbar.

A standard Print dialog is displayed. Select the page(s) to print, then click **OK**. When using this option (or the next one), be sure to enter the page number(s) displayed in Adobe Acrobat; do not use the page number(s) listed in the footer(s) of the manual.



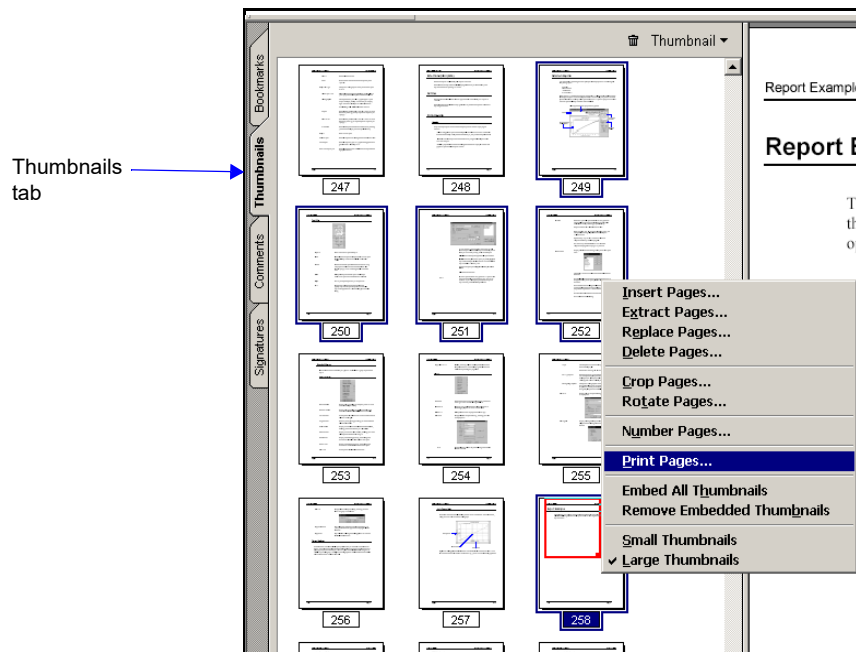
- Select **File > Print**.

A standard Print dialog is displayed. Select the page(s) to print, then click **OK**.

- Click the **Thumbnails** tab.

Thumbnails of manual pages are displayed.

- a. Click the pages you want to print.
- b. Right-click to display a shortcut menu, then select **Print Pages**.
- c. A standard Print dialog is displayed; click **OK**.



## Specifications

The SediGraph 5120 Particle Size Analysis System has been designed and tested to meet the specifications provided below.

Characteristic	Specification
<b>ANALYZER</b>	
Particle Diameter Range	300 to 0.1 $\mu\text{m}$ Equivalent Spherical Diameter
Resolution	The sedimenting sample is scanned by a narrow x-ray beam - less than 0.2% of the total distance scanned - permitting high resolution.
Wetted Materials	Stainless steel, Teflon <sup>®</sup> impregnated anodized aluminum, nickel plated aluminum, nylon, polypropylene, polystyrene, Tygon <sup>®</sup> tubing, tungsten carbide, Ertalyle <sup>®</sup> , Viton <sup>®</sup> , Kalrez <sup>®</sup> , glass, and epoxy.
Sample Size	50 mL of dispersed sample; precise concentration is not required
Suspending Liquids	Any liquid compatible with sample cell materials and not highly absorptive of X-rays (typical liquids are water, glycols, mineral oils, Sedisperse <sup>®</sup> , and alcohols)
Voltage	85 to 264 VAC
Frequency	47 to 63 Hz
Power	450 VA
Temperature	Ambient +10 to 40 °C, operating; -10 to 55 °C, storing or shipping
Humidity	Up to 90% relative (non-condensing); 20 to 80% for computer and components
Physical	Height: 52 cm (20.5 in.) Width: 50.5 cm (20 in.) Depth: 58 cm (23 in.) Weight: 43 kg (95 lb)

Characteristic	Specification
<b>COMPUTER</b>	
Minimum requirements	Pentium 333 MHz or equivalent One CD-ROM drive 128 megabytes of RAM 1-gigabyte hard drive SVGA monitor (800 x 600 video display capability) Windows <sup>®</sup> XP or 2000 One RS232 serial port for each attached instrument Mouse
<b>MASTERTECH</b>	
Sample Capacity	18 per tray; continuing indefinitely if tray is replenished
Sample Size	0.001 to 4 g powder in 60 to 80 mL of liquid
Suspending Liquid	Any liquid compatible with wetted materials (typical liquids are water, glycols, mineral oils, alcohols, SediSpere <sup>®</sup> , (and mineral spirits)
Wetted Materials	Stainless steel, Viton <sup>®</sup> , Tygon <sup>®</sup> , silicone rubber, polypropylene
Voltage	100, 120, 220 or 240 VAC $\pm$ 10%
Fuse	2A (100/120 VAC); 1A Type T, Slow-Blow (220/240 VAC)
Power	250 VA
Frequency	50/60 Hz.
Temperature	10 to 40°C, operating: -10 to 55°C, storing or shipping
Humidity	20 to 80% relative (non-condensing)
Physical	Height: 71 cm (28 in.) Width: 46 cm (18 in.) Depth: 53 cm (21 in.) Weight: 18 kg (40 lbs)

## 2 USER INTERFACE

Controls and Indicators	2-4
Turning On and Off the Analyzer	2-8
Using the Software	2-9
Menu Structure	2-16
Windows Menu	2-17
Help Menu	2-17



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## Overview

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This chapter contains:

- a description of the controls and indicators located on the SediGraph and the MasterTech.
- instructions for turning the analyzer on and off.
- a description of common software features.
- a description of the accelerator keys that can be used with the SediGraph application.
- instructions for selecting sample information files.
- SediGraph application file name conventions.
- a description of the SediGraph application menu structure and descriptions of the Windows and Help menus.

## Controls and Indicators

The SediGraph 5120 system is fully automatic. The computer is used to enter operational information and view system status. There are, however, controls and indicators on the SediGraph and MasterTech with which you should become familiar.

### SediGraph 5120

#### Front Panel



#### **X-RAY STATUS**

Displays the status of the X-ray system.

#### **X-Ray STANDBY indicator**

Illuminates when the SediGraph is on and the X-ray keyswitch is turned to the standby position, when the door to the analysis compartment is open, or when the fan or pump is not operational.

#### **X-RAY ON indicator**

Illuminates when X-rays are being generated. The X-ray keyswitch must be turned to the X-RAY ON position.

#### **X-Ray Keyswitch**

Sets the X-ray to either the On or Standby position.



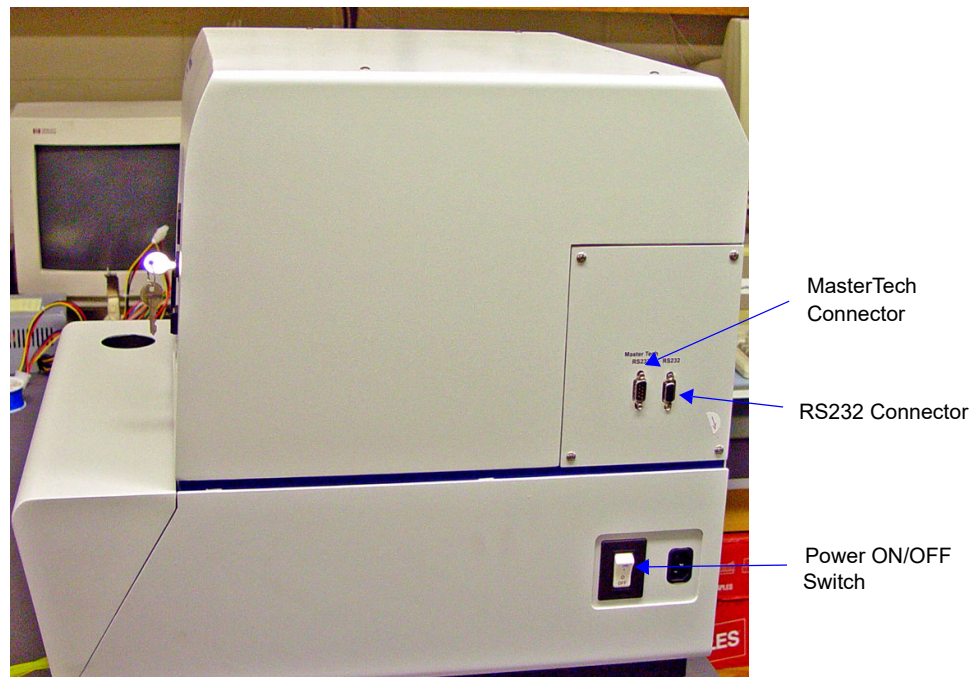
**Pump Control Off/Auto switch**

Selects the operational mode of the mixing and cell pumps.

The *Off* position turns off power to the pumps. The *Auto* position places the pumps in automatic mode.

**Mixing Chamber**

Contains the sample during an analysis and maintains sample dispersion throughout the analysis with a built-in stirrer.

**Side Panel****ON/OFF switch**

Turns electrical power to the SediGraph on and off. Place the switch in the up (|) position to turn on the SediGraph and in the down (O) position to turn off the SediGraph.

**MasterTech RS232**

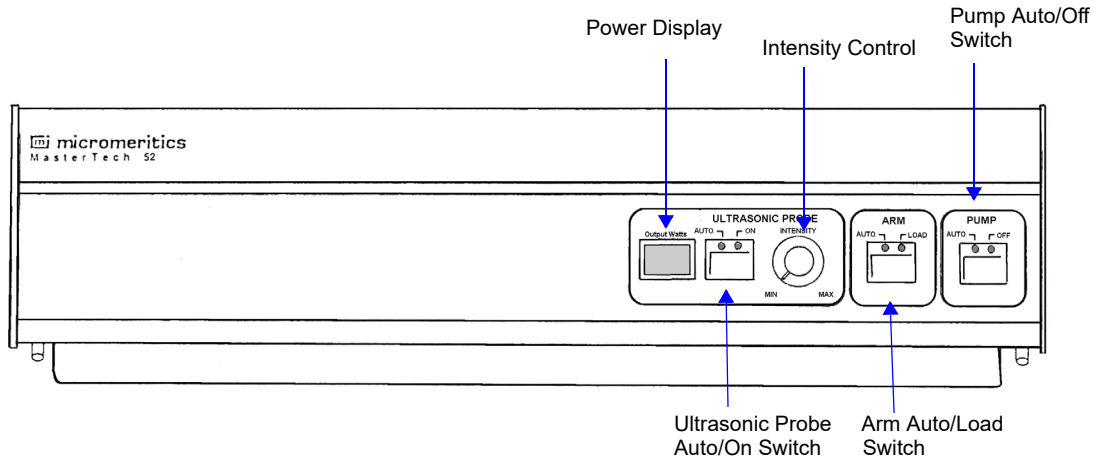
Used to connect the MasterTech to the SediGraph.

**RS232**

Used to connect the computer to the SediGraph.

## MasterTech 052

### Front Panel



**Power Display** Displays the power being generated by the ultrasonic probe.

**ULTRASONIC PROBE AUTO/ON switch** LEDs on the switch indicate the mode of operation. The *AUTO* position places the probe under automatic control. The *ON* position turns on the probe. Remove the probe from its holder and place it in the liquid before turning on the probe.



**Never turn the probe on unless the tip is submerged in liquid.**

After using the probe, press the switch again to place the probe in automatic mode. Then replace it in its holder.

**INTENSITY control** Turn the control clockwise to increase the intensity of the probe. Turn it counterclockwise to decrease the intensity.

**ARM AUTO/LOAD switch** The LEDs on the switch indicate the mode of operation.



**Do not press the ARM AUTO/LOAD switch while an automatic operation is in progress.**

The *AUTO* position places the arm under automatic control.

The *LOAD* position raises the arm when you want to remove or load the tray.

This switch will not work unless the computer is installed and the SediGraph software is operating.

The MasterTech will not operate if the arm is in the Load position, so be sure to release the *LOAD* switch when you have finished removing or loading the beaker tray.

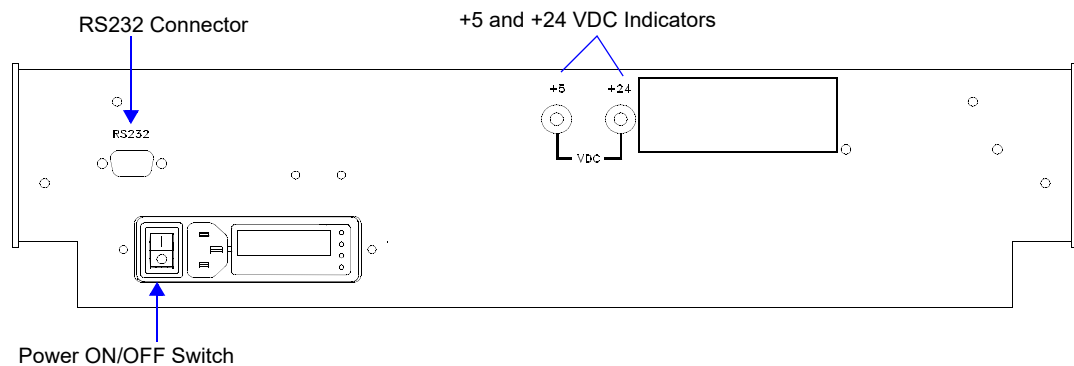
### **PUMP AUTO/OFF switch**

The LEDs on the switch indicate the mode of operation.

The *AUTO* position places the pump under automatic control.

The *OFF* position turns off power to the pump.

## **Rear Panel**



### **POWER ON/OFF switch**

Turns the MasterTech on and off.

The down (O) position turns off the MasterTech.

The up (|) position turns on the MasterTech.

### **+5 and +24 VDC indicators**

Illuminate when appropriate power is present in the MasterTech.

### **RS232 connector**

Used to connect the MasterTech to the SediGraph.

---

## Turning On and Off the Analyzer

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### Turning On the Analyzer

---

1. If not already on, turn on the computer to which the analyzer is connected.
2. Place the PUMP CONTROL switch (located on the front panel) in the AUTO position.
3. Place the SediGraph ON/OFF switch (located on the side panel) in the ON (|) position.
4. Insert the X-ray key into the X-ray keyswitch. Then turn the switch to the X-RAY ON position.
5. Wait 30 minutes for the SediGraph to warm up before performing an analysis.



**It is recommended that the analyzer remain on unless it is going to be idle for a period of more than 24 hours. Leaving the analyzer on helps prolong the life of its major components.**

### Turning Off the Analyzer

---



**Always exit the analysis program and Windows before turning off the computer. Failure to do so could result in loss of data.**

1. Select **Close** from the System menu or **Exit** from the File menu.

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

**Instrument is busy. Continue program exit?**

Even if you click **Yes** and the analysis program closes, the analysis continues and data continue to be collected. Reports that are queued under the Print Manager will print. If, however, a power failure occurs and an uninterruptible power supply (UPS) is not attached, the data collected *after exiting* the analysis program are lost.

2. Place the computer, monitor, and printer ON/OFF switches in the OFF position.
3. Place the SediGraph ON/OFF switch in the OFF (O) position.

---

## Using the Software

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The SediGraph 5120 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; however, you may need to refer to your Windows documentation or the Windows tutorial to clarify functions which are specific to Windows. Since most SediGraph 5120 operators use a mouse, this manual is written for mouse-driven operations.

---

### Mouse

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Use the mouse to select *items* displayed on the screen. Simply move the mouse pointer to the item you wish to select and click the left mouse button once.

When selecting *files*, move the mouse pointer to the file you wish to select and click the left mouse button twice (double-click). You also may click just once, then click **OK** or press **Enter**.

Use the mouse also to display drop-down menus for items contained on the instrument schematic. Move the mouse pointer to the item you wish to select and click the *right* mouse button once.

---

### Keyboard

---

Accelerator (or shortcut) keys may be used instead of, or in addition to, a mouse. With the main menu displayed, simply press the accelerator key(s) for the function desired. For example, if you wish to open a Sample Information file, press **F2** and the Open Sample Information dialog box is displayed. You may also access any function that contains an underlined letter by pressing **Alt** plus the underlined letter. For example, to access the **File** menu, simply press **Alt**, then **F**.

The following table lists the accelerator key(s) which you may use for operating the SediGraph 5120 Analysis program.

<b>Accelerator Key(s)</b>	<b>Function</b>
<b>F1</b>	Access online manual
<b>F2</b>	Open a sample information file
<b>F3</b>	Open an analysis conditions file
<b>F4</b>	Open a liquid properties file
<b>F5</b>	Open a report options file
<b>F6</b>	Tile windows
<b>F7</b>	Cascade windows
<b>F8</b>	Start report
<b>F9</b>	Cancel report
<b>Alt + F4</b>	Exit the analysis program
<b>Shift + F2</b>	List sample information files
<b>Shift + F3</b>	List analysis conditions files
<b>Shift + F4</b>	List liquid properties files
<b>Shift + F5</b>	List report options files

## Dialog Boxes and Subdialog Boxes

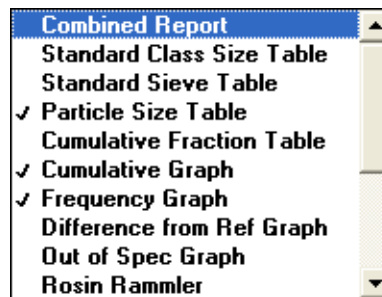
Dialog boxes (referred to as dialogs) are displayed when you select a menu item. Subdialog boxes (referred to as subdialogs) are displayed when a push button in a dialog box is selected. Both types of boxes may contain one or more of the following:

- **Data entry field**

These fields may be either numeric (numbers only) or alphanumeric (numbers, letters, or printable characters). If you make an invalid entry in either of these fields, an error message displays.

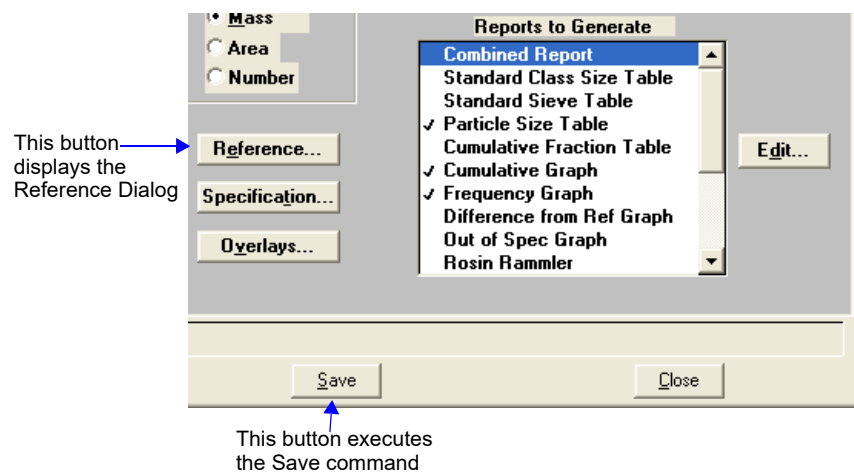
- **List**

A list contains selections from which you may choose one or more items. To select an item on the list, position the mouse pointer on the desired selection, then double-click (or press the **Spacebar**). An item is selected if it is preceded with a check mark.



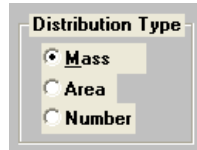
- **Push Button**

A push button is used to display subdialogs in which to enter additional information about the subject matter or to execute a command.



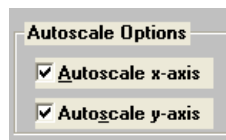
- **Radio Button**

Radio buttons are contained within a group box. These buttons are used to select options; you may choose only one item.



- **Check Boxes**

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



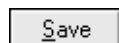
The following push buttons are common to several dialogs.



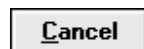
Displays a dialog which allows you to select a file for the subject matter.



Allows you to copy file values from an existing file into the one you are creating. You then can edit the values in the new file without changing the ones in the original file.



Saves the information you entered in the dialog.

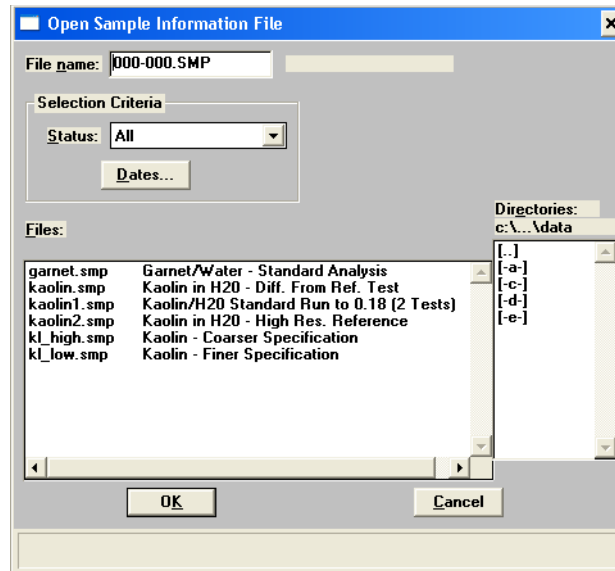


Cancels the entries you made in the dialog.



## Selecting Files

Sample information is stored in files and saved under file names. Certain dialogs contain a **Files:** list box which displays a list of files available for that particular operation. For example, the Open Sample Information dialog:



Sometimes a default file name appears in the **File name:** field. If you wish to use the default name, just click **OK**. Use one of the following methods if you wish to use another file name:

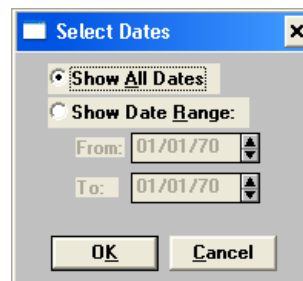
- Enter a name in the **File name:** field, the extension .SMP is added automatically.
- From the list of files in the **Files:** list box, move the mouse pointer to the desired file and double-click.

You may limit the list of files displayed in the **Files:** list box by choosing one 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 can limit the list of files displayed to those containing **Sg0** as the first three characters by entering Sg0\*.smp.

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



Select the **Show Date Range:** radio button. This enables the **From:** and **To:** fields so that you may enter a beginning and ending date. You also may double-click in each field to display a calendar to set a date. The range of dates remains the default until you change the dates or select *Show All Dates*.

For convenience, the following function keys are available when the Select Dates dialog is displayed:

**F2** Clears the field

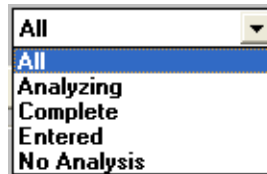
**F3** Inserts the current date

**F4** Displays a calendar from which you may select a date



**You may change the date format by using the International Date Format function on the Windows Control Panel.**

- Select a file status from the Status drop-down list. The table below describes each file status.



Status	Description
<b>All</b>	All sample information files in the specified directory and within the specified range of dates.
<b>Analyzing</b>	Sample information files that are currently being used for analysis.
<b>Complete</b>	Sample information files that were used in an analysis that has been completed.
<b>Entered</b>	Sample information files that contain manually entered data.
<b>No analysis</b>	Sample information files that have not been used to perform an analysis.

## File Name Conventions

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For sample information files, a default file name (the next available sequence number) and a default extension are displayed. For Analysis Conditions, Report Options, and Liquid Properties files, only a default extension is displayed.

The following table shows the file name extensions for the SediGraph 5120 analysis program.

File Type	Extension
Sample Information	SMP
Analysis Conditions	ANC
Report Options	RPO
Liquid Properties	LIQ
Export to disk (ASCII)	EXP
For conversion from non-Windows SediGraph 5100	DAT
Report to disk	RPT
Report (saved from the report window)	REP
List to disk	LST

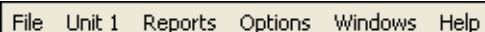
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## Menu Structure

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### Main Menu Bar

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File Unit 1 Reports Options Windows Help

All functions of the SediGraph 5120 are accessed from the main menu bar. Brief descriptions are provided below; refer to the chapter given in parentheses for a detailed description of the options contained on that menu.

<b>File</b>	Allows you to manage sample and parameter files. (Chapter 5, <a href="#">FILE MENU</a> )
<b>Unit [n]</b>	Enables you to perform analyses, measure baselines and perform other instrument operations. (Chapter 6, <a href="#">UNIT MENU</a> )  This menu does not appear if the analysis program is being used for offline data manipulation.
<b>Reports</b>	Enables you to generate and cancel reports. (Chapter 7, <a href="#">REPORTS MENU</a> )
<b>Options</b>	Allows you to edit sample defaults, specify the printer for reports, and select data presentation formats. (Chapter 8, <a href="#">OPTIONS MENU</a> )
<b>Windows</b>	Enables you to arrange the windows and icons on your screen. It also displays the names of all open windows. (This chapter. <a href="#">Windows Menu</a> )
<b>Help</b>	Displays Help information. (This chapter. <a href="#">Help Menu</a> )

---

## Windows Menu

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### Windows

Allows you to arrange your open windows and icons.

*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 windows title remains visible, making it easier to select other windows.

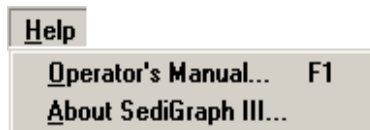
*Arrange icons* arranges all minimized icons in an orderly manner.

The Windows menu also displays all open files.

---

## Help Menu

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### Operator's Manual

Displays the SediGraph 5120 operator's manual in PDF format.

### About SediGraph III

Displays information about the SediGraph 5120 analysis program.



### 3 OPERATIONAL PROCEDURES

Overview	3-3
Status Display	3-7
Defining the Default Sample Information File	3-10
Creating a Sample Information File	3-14
Defining an Analysis Conditions File	3-22
Defining a Liquid Properties File	3-26
Defining a Report Options File	3-28
Performing a Drain and Load Operation	3-30
Performing a Baseline Measurement	3-32
Performing an Analysis	3-34
Performing a Rinse Operation	3-46
Generating a List	3-50
Exporting a Sample Information File	3-51
Converting Non-Windows Sample Files	3-52
Generating Reports	3-53
Generating Overlays	3-63





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## Overview

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This chapter describes the procedures for entering sample information and sample conditions, performing analyses, exporting sample files, converting non-Windows sample files, and generating analysis reports. For detailed information about each field and the push buttons available in the dialog boxes shown in this chapter, refer to Chapters 5 through 8.

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### Reading Status Displays

---

The first topic following the Overview in this chapter describes the upper and lower status displays that appear in the operational windows of the system.

Topic	Refer to page
Status Display	<a href="#">3-7</a>

---

### Defining the Default Sample Information File

---

The 5120 is shipped with a default sample information file, which you may customize to meet your laboratory's requirements.

The following topic describes how to customize the default sample information file.

Topic	Refer to page
Defining Sample Defaults	<a href="#">3-10</a>

---

### Creating Sample Information Files

---

*Sample information files* are permanent records of analyses performed with the SediGraph 5120. Prior to performing analyses, you must create sample information files that contain the conditions used to control the analyses. After an analysis, the data collected during the analysis (or, optionally, manually entered data) are stored in the file, with the analysis conditions.

You can choose to generate specific reports during an analysis. You can also open the stored sample information file at anytime after the analysis and generate reports.

You must assign a sample information file to every analysis. A sample information file consists of five parts:

- sample identification
- material properties
- analysis options
- report options
- collected/entered data

Parts of the sample file can also exist as *parameter files* separate from the sample information file itself. These parameter files contain frequently used analysis conditions which may be conveniently loaded into a new sample information file. They also may be edited as required.

You can create and store any number of sample information files. Sample information files can be:

- created and stored for use by laboratory analysts when performing analyses
- created as needed when performing analyses
- created automatically by performing a Quick Start or MasterTech Automatic analysis

The following topics in this chapter describe how to create sample information files and the parameter files contained within them:

Topic	Refer to page
Creating a Sample Information File	<a href="#">3-14</a>
Defining an Analysis Conditions File	<a href="#">3-22</a>
Defining a Liquid Properties File	<a href="#">3-26</a>
Defining a Report Options File	<a href="#">3-28</a>

## Preparing for Analyses

Before you can collect baseline data or perform an analysis, the cell and mixing chamber must be drained and the sample (or baseline liquid) loaded.

A baseline measurement must be performed before running analyses. It is not necessary to measure a baseline for each analysis; it is recommended, however that you perform a baseline measurement once per shift and when you change dispersing agents.

The following topics in this chapter describe how to prepare for analyses:

Topic	Refer to page
Performing a Drain and Load Operation	<a href="#">3-30</a>
Performing a Baseline Measurement	<a href="#">3-32</a>

## Performing Analyses

The SediGraph 5120 provides several methods for performing analyses as described in the following table:

If you wish to...	Then perform this type of analysis...	Refer to page
Perform a single sample analysis	Sample Analysis	<a href="#">3-35</a>
Perform analyses on multiple samples using the same analysis conditions; sample files are created automatically.	Quick Start	<a href="#">3-39</a>
Perform multiple analyses on the same sample	Repeat Schedule	<a href="#">3-41</a>
Perform analyses on a series of samples of the same type with the same analysis conditions; sample files are created automatically. (Requires a MasterTech)	MasterTech Automatic	<a href="#">3-42</a>
Perform analyses on a series of samples which are different in size and shape and consequently require different analysis conditions. (Requires a MasterTech)	MasterTech Schedule	<a href="#">3-44</a>

After performing an analysis, the system must be rinsed to remove any debris or contaminants from the analysis cell. Options are provided that enable you to rinse the SediGraph, the MasterTech, or both instruments. Refer to [“Performing a Rinse Operation”](#) on page 3-46.

## Listing, Exporting, and Converting Sample Files

The SediGraph application contains features that enable you to:

- view and print a list of sample information files.
- export tabular data from sample information files in ASCII format.
- convert sample information files created with the non-Windows version of the SediGraph 5100 analysis program to a file that is compatible with the SediGraph 5120 application.

The following topics in this chapter describe how to use these features:

Topic	Refer to page
Generating a List	<a href="#">3-50</a>
Exporting a Sample Information File	<a href="#">3-51</a>
Converting Non-Windows Sample Files	<a href="#">3-52</a>

## Generating Reports

---

A number of report types, including tabular and graphical formats are included in the SediGraph application. The following topics in this chapter describe how to generate reports:

Topic	Refer to page
Tabular and Graphical Reports	<a href="#">3-57</a>
Baseline Reports	<a href="#">3-58</a>
Statistical Process Control Reports	<a href="#">3-59</a>
Regression Report	<a href="#">3-60</a>
Control Chart Report	<a href="#">3-61</a>
PSD History	<a href="#">3-63</a>
Overlays	<a href="#">3-63</a>

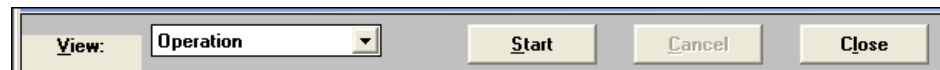
## Status Display

All operational windows contain two common status displays; one appearing in the upper portion of the window and one in the lower portion. Some status displays may contain more items than others, depending on the type of operation in process. The center portion of the window contains the activity of the current operation.

In addition, you can display the status of the current operation by selecting **Unit [n] > Show Status**.

### Upper Display Items

The following is a typical upper status display.



#### View

Allows you to choose which view you wish displayed in the window.

*Choices: Operation, Analysis Log, Analysis Results, Instrument Schematic*

*Operation* displays the current status of an operation, for example: analysis, baseline, etc.

*Analysis Log* displays a list of recent operations and error messages for the active analyzer. By default, sample analyses and error messages are logged for seven days and baselines are logged for 30 days. You may receive a printout of the analysis log by clicking **Report**.



**The period for which these entries are retained may be changed in the WIN5120.INI file under the Unit section.**

*Analysis Results* displays the results of the current analysis.

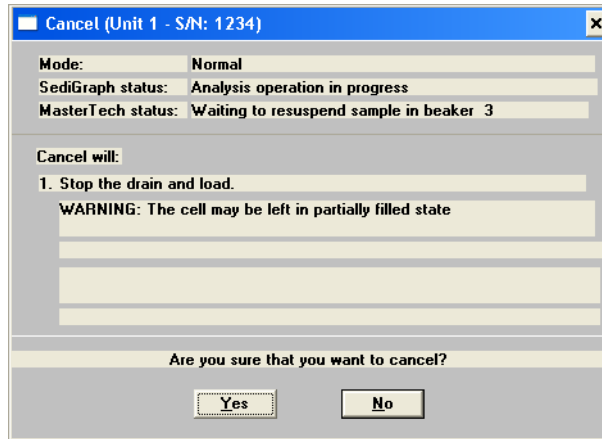
*Instrument Schematic* displays a schematic of the instrument.



Begins the current operation; the button then changes to **Stop**. This button is disabled if another operation, such as rinsing, is in progress.



Cancels the current operation. In some dialogs, this push button appears in the lower status display. When you click this push button, the Cancel dialog is displayed.



This dialog is divided into three sections:

**Upper:** displays the operation status.

**Middle:** lists the consequences of cancellation.

**Lower:** requests you to verify cancellation; click **Yes** to cancel or **No** if you decide to continue the operation.

When you click **Yes**, the actual operation is cancelled, but the operation window remains open.



Performs the same function as **Cancel**, only the operation window closes.

In some dialogs, this button appears in the lower status display.

## Lower Display

---

The following is a typical lower status display.

<b>Mode:</b>	Normal	<b>Time Remaining:</b>	1:23 hrs:min
<b>SediGraph:</b>	Analysis operation in progress	<b>Cell Temp.:</b>	34.5 °C
<b>Sample:</b>		<b>X-Ray Counts:</b>	114 KCnts/s
<b>MasterTech:</b>	Waiting to resuspend sample in beaker 3	<b>Mass Percent:</b>	23.0 %
<b>Sample:</b>		<b>Diameter:</b>	123.4500 µm

<b>Mode:</b>	Displays the type of operation being performed.
<b>SediGraph:</b>	Displays the status of the analyzer, such as <i>Analysis operation in progress</i> , <i>Idle</i> , <i>Waiting for load</i> , etc.
<b>Sample:</b>	Displays the name of the sample file involved in the operation. This field also displays for the MasterTech if one is being used.
<b>MasterTech:</b>	Displays the status of the MasterTech. This field is visible only when a MasterTech is being used.
<b>Time Remaining:</b>	Displays the time remaining in the analysis. This field is visible only when an analysis is in progress.
<b>Cell Temp.:</b>	Displays the temperature of the liquid in the analysis cell.
<b>X-Ray Counts:</b>	Displays the intensity of the X-ray in kilocounts/sec
<b>Mass Percent:</b>	Displays the current mass percent in the analysis.
<b>Diameter:</b>	Displays the current particle size in the analysis.
<b>Analysis Time:</b>	Displays the approximate time for the analysis.

---

## Defining the Default Sample Information File

---

The SediGraph 5120 is shipped with a default sample information file. Whenever you create a new sample information file, the values in the default file are copied into the file; you can edit them if desired.

The contents of a sample information file can be viewed and edited in one of two ways: *Basic*, which displays a limited set of analysis parameters or *Advanced*, which displays all the parameter files contained in a sample information file.

You can customize the default sample information file in either format to meet your laboratory's needs.

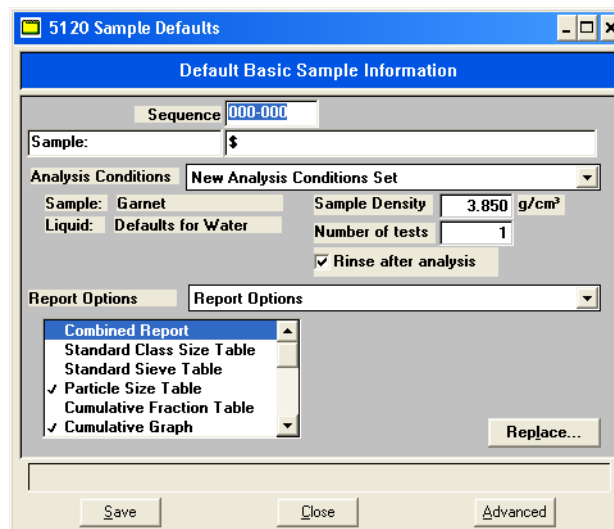
---

### Using the Basic Format

---

Perform the following steps to define the default sample information file using the Basic format.

1. Select **Options > Option presentation > Basic** to select the Basic format.
2. Select **Options > Sample defaults**; the Default Basic Sample Information dialog is displayed.



3. Sample information files contain sequence numbers. The next available sequence number is displayed in the **Sequence** field. This is the number that will appear in the **File name** field when you select **File > Open > Sample information**.

You may change this number if desired.



When you accept the next sequence number or enter a new one, the values you enter will remain as the default values for all new sample information files until you change the default file again.

4. In the right field of the **Sample** line, enter a format for the identification. Be sure to include the \$ symbol if you want the sample file number included as part of the identification.



**You can also edit the word *Sample*. For example, you may prefer to use *Test*.**

5. From the **Analysis Conditions** drop-down list, choose the analysis conditions file you wish to display as the default.
6. From the **Report Options** drop-down list, choose the reports options file you wish to display as the default.
7. In the reports list box, choose the reports you wish to use as the defaults.
8. Click **Save**, then **Close**.

## Using the Advanced Format

Perform the following steps to define the default sample information file using the Advanced format.

1. Select **Options > Option presentation > Advanced** to select the Advanced format.
2. Select **Options > Sample defaults**; the 5120 Sample Defaults dialog is displayed.

3. Sample information files contain sequence numbers. The next available sequence number is displayed in the **Sequence** field. This is the number that will appear in the **File name** field when you select **File > Open > Sample information**.

You may change this number if desired.

When you accept the next sequence number or enter a new one, the values you enter will remain as the default values for all new sample information files until you change the default file again.

4. In the right field of the **Sample** line, enter a format for the identification. Be sure to include the \$ symbol if you want the sample file number included as part of the identification.



**You can also edit the word *Sample*. For example, you may prefer to use *Test*.**

5. Edit the **Operator** and **Submitter** lines as desired. Or you can have them omitted entirely by selecting **Omit**.

6. Specify user parameters (if desired). These fields provide additional sample characterization available for SPC reports. For example, you may wish to specify sample weight or temperature. If you specify a parameter, enter a default for that parameter in the fields on the right. Or, like the operator and submitter prompts, you can have them omitted by selecting **Omit**.
7. Enter comments to be stored in the sample information file in the **Comments** field if desired.
8. Select the Material Properties tab (or **Next>>**); the Material Properties dialog is displayed.
  - a. Choose the options you wish to use as the defaults. (Refer to [“Defining an Analysis Conditions File” on page 3-22.](#))
  - b. Click **Save**.
9. Select the Analysis Options tab (or **Next >**); the Analysis Options dialog is displayed.
  - a. Choose desired analysis options. (Refer to [“Defining an Analysis Conditions File” on page 3-22.](#))
  - b. Click **Save**.
10. Select the Report Options tab (or **Next >**); the Report Options dialog is displayed.
  - a. Choose desired report options. (Refer to [“Defining a Report Options File” on page 3-28.](#))
  - b. Click **Save**, then **Close**.

---

## Creating a Sample Information File

---

An analysis must have a sample information file assigned to it. The file consists of information groups which, collectively, identify the sample (sample information), guide the analysis (analysis conditions, liquid properties), and specify the data reduction (report options).

After an analysis, the data collected during the analysis (or manually entered data) are also stored in the file for future reference or report generation.

A sample file may be created in one of three formats. In each of these formats, the sample default information data is copied into the sample file and you may edit it as desired:

- **Basic.** This format presents a single window in which you select predefined parameter files for your analysis. In this format, you can switch to Advanced format if necessary.
- **Restricted.** This format is identical to the Basic format, except that certain menu options become disabled. In the Restricted mode, you cannot convert non-Windows sample files or define defaults for SPC reports or sample files. You also cannot switch to Advanced format.
- **Advanced.** This format provides complete access to all parts of the sample file, allowing you to edit quickly any parameters as necessary.

In addition, the application provides another convenient method of creating sample information files using the Replace function. In each of the formats listed above, a **Replace** push button is located in the Sample Information dialog box. You can use this command to copy the data from an existing sample information file into the one you are creating.

This feature is convenient for creating numerous "default" sample files. For example, you could set up a sample information file for each type of material you wish to analyze. Then, when performing an analysis, copy the sample file for the desired material into the new file and edit if required.

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## Using the Basic or Restricted Format

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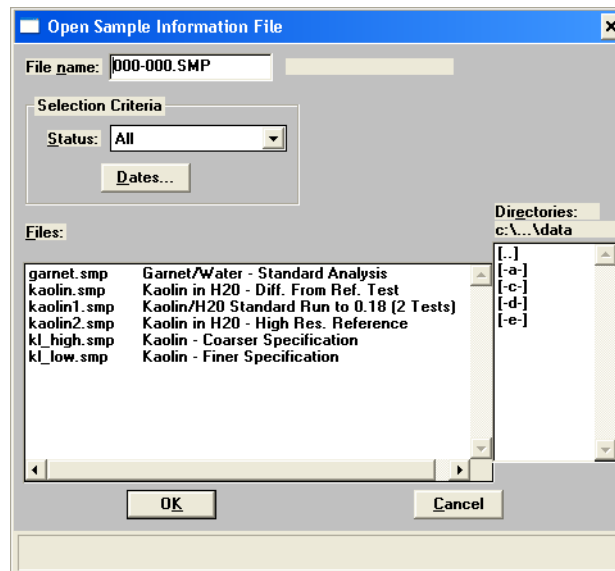
The Basic and Restricted formats are the easiest and most direct way to create a sample file because you create your file using predefined analysis conditions and report options files. If more detailed conditions or custom files are required, you must use the Advanced format (discussed later). Even if you begin your sample file in the basic format, you can switch to Advanced by clicking **Advanced** if you need to edit analysis options.

The instructions for creating sample files in the Restricted format are the same as the Basic format with the following exceptions:

- Certain menu options become disabled (refer to [“OPTIONS MENU” on page 8-1](#)).
- You cannot switch to Advanced mode.

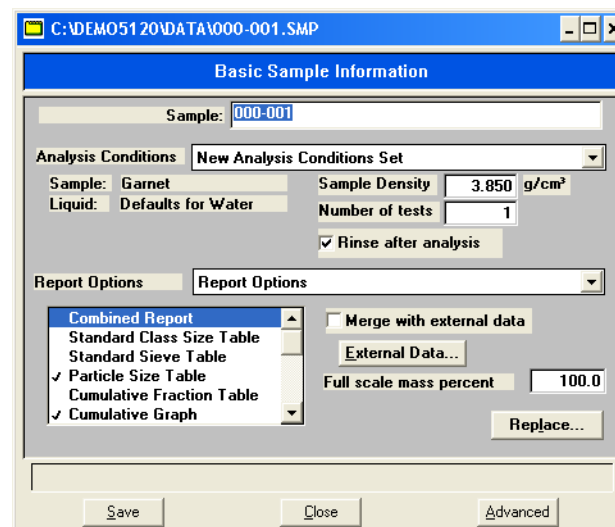
Perform the following steps to create a sample information file using the basic format.

1. Make sure that **Options > Option presentation > Basic** is selected.
2. Select **File > Open > Sample Information**; the Open Sample Information File dialog is displayed.



3. Accept the next sequenced file number or enter a new name in the **File name** field.
4. Click **OK**; the following message is displayed:
 

**File [name] does not exist. Do you wish to create it?**
5. Click **Yes**; the Basic Sample Information dialog is displayed.



6. Select the down arrow at the **Analysis Conditions** field and choose an Analysis Conditions set from the drop-down list.
7. Select the *Rinse after analysis* option.



**It is highly recommended that you leave the Rinse after analysis option selected. De-selecting this option may speed up analyses, but inaccurate data may be produced.**

8. Select the down arrow at the **Report Options** field and choose a Report Options file from the drop-down list.
9. In the Report Options list box, select any reports you wish to have generated. (Reports are selected when preceded by a check mark.)



**Using your mouse pointer or the arrow keys, move to the report you wish to generate and double-click (or press the Spacebar). You may deselect reports in the same manner.**

10. In the **Full scale mass percent** field, enter the percentage of the sample you wish to be analyzed. Unless you plan to analyze a portion of the sample by some other method, this should be left at 100%.



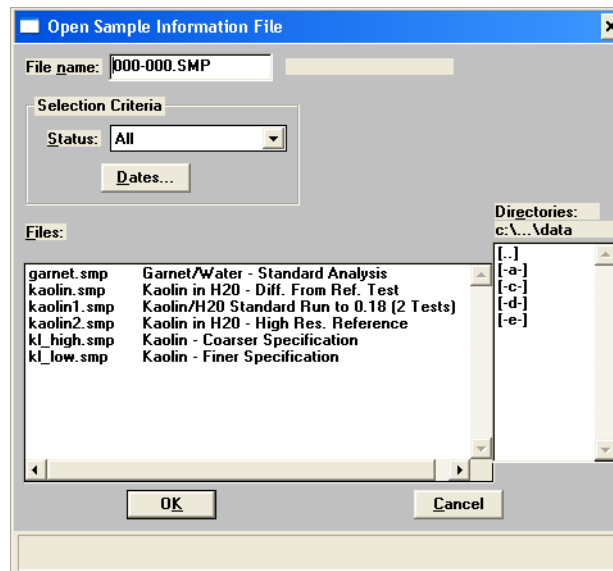
**If you wish to merge data collected by another method with the data collected with this analysis, skip this step and proceed to the next one for instructions.**

11. If you wish to merge alternatively collected data with the data to be collected with this file, select *Merge with external data*.
  - a. Click **External Data...**; the External Data dialog is displayed.
  - b. Choose whether the external data is particle size or sieve size.
  - c. In the table, enter the data (particle size or sieve) collected from the alternative method.
  - d. Choose the type of distribution provided by the external analysis method.
  - e. Click **OK**.
12. Click **Save** then **Close**.

## Using the Advanced Format

The Advanced format presents all parts of the sample file in an index-card manner. This allows you to customize your sample file.

1. Make sure that **Options > Option presentation > Advanced** is selected.
2. Select **File > Open > Sample Information**; the Open Sample Information File dialog is displayed.



3. Accept the next sequenced file number or enter a new name in the **File name** field.
4. Click **OK**; the following message is displayed:

**File [name] does not exist. Do you wish to create it?**

- Click **Yes**; the Advanced Sample Information dialog is displayed.

- In the right field of the **Sample** line, enter a sample identifier. Be sure to include the \$ symbol if you want the sample file number included as part of the identifier.



**You can also edit the word *Sample*. For example, you may prefer to use *Test*.**

- Edit the **Operator** and **Submitter** lines as desired.



**These fields are not displayed if omitted in the default sample information file.**

- Specify user parameters (if desired). These fields provide additional sample characterization available for SPC reports. For example, you may wish to specify sample weight or temperature. If you specify a parameter, enter a value for that parameter in the fields on the right.

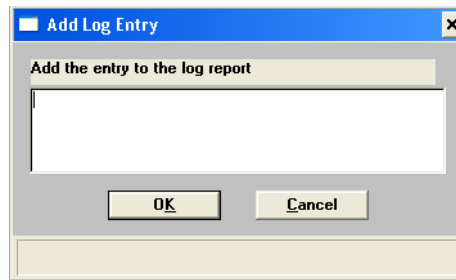


**These fields are not displayed if omitted in the default sample information file.**

- Enter comments to be stored in the sample information file in the **Comments** field if desired.



10. If you wish to enter information about this sample information file in the sample log, click **Add Log Entry**; the Add Log Entry dialog displays.



Enter your comments, then click **OK**. Anything you enter in this dialog appears in the Instrument Log Report.

11. After you complete the sample information window, click on the next desired tab to open its associated dialog. Refer to: [“Defining an Analysis Conditions File” on page 3-22](#) and [“Defining a Report Options File” on page 3-28](#).

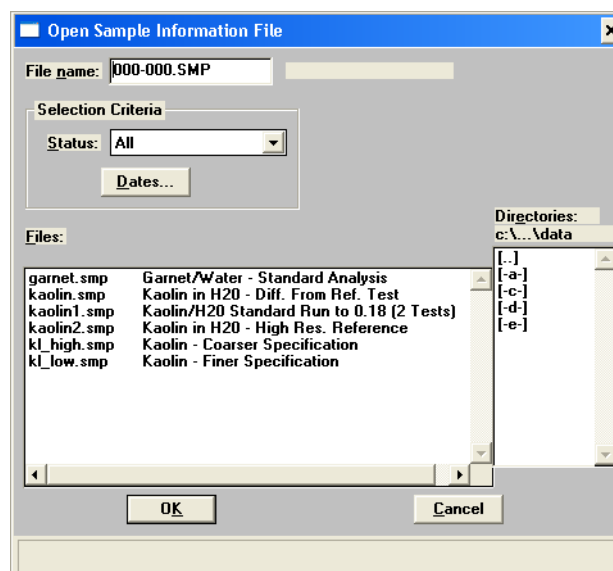


You also can use **Next>>** and **<<Prev** to move between tabs.

## Using the Replace Command

The Replace feature enables you to create a new sample information file by copying the contents of an existing sample information file and modifying the contents if desired.

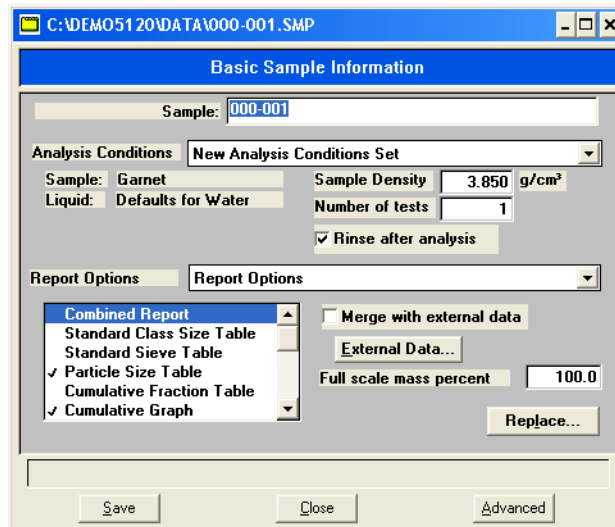
1. Select **File > Open > Sample Information**; the Open Sample Information File dialog is displayed.



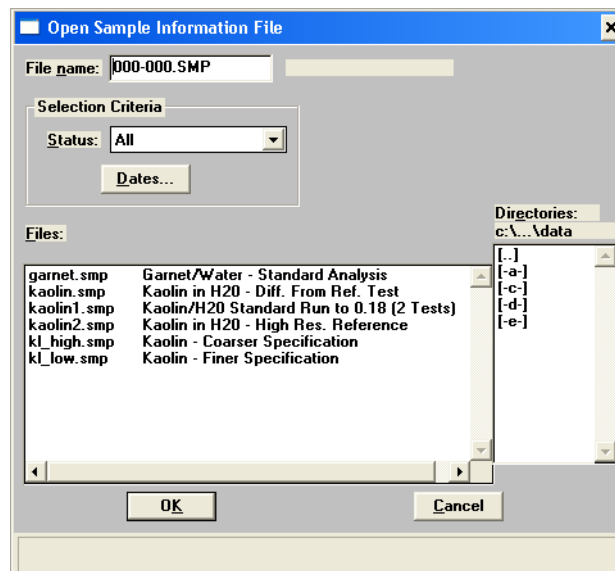
2. Accept the next sequenced file number or enter a new name in the **File name** field.
3. Click **OK**; the following message is displayed:

**File [name] does not exist. Do you wish to create it?**

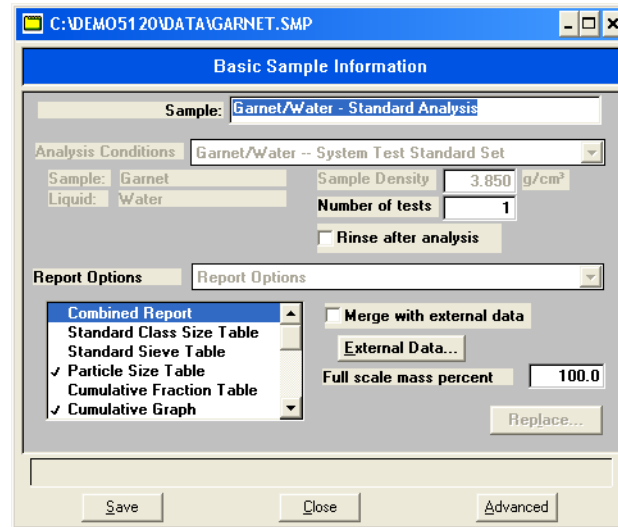
4. Click **Yes**; the Sample Information dialog is displayed in the format selected in the Options menu.



5. Select **Replace** (in Basic format) or **Replace All** (in Advanced format); the Open Sample Information dialog is displayed.



6. Select the file you wish to copy from the **Files:** list; then click **OK**. The Sample Information dialog is displayed with the copied data.



7. You may modify the data if desired. When you have finished making modifications, click **Save**, then **Close**.

---

## Defining an Analysis Conditions File

---

Analysis conditions specify the data used to guide an analysis. Analysis conditions can be created in an independent file and used as often as needed. Once you load the analysis conditions file into the sample file, you can edit the parameters as desired; the original analysis conditions file remains unchanged. This feature is especially useful if you have a certain type of sample material that you analyze on a regular basis.

Several analysis conditions files, located in the PARAMS subdirectory, are included with the SediGraph 5120 analysis program

Analysis conditions files are comprised of three sets of data:

- **Material Properties** - define the sample material, the liquid properties, and the type of analysis to be performed.
- **Liquid Properties** - define certain physical characteristics of sedimentation liquids used for the analysis.
- **Analysis Options** - define MasterTech operation and analysis conditions.

Liquid properties reside in an independent file, which can be used in analysis conditions files as often as needed. When you load the liquid properties file into an analysis conditions file, you can edit the parameters as desired; the original liquid properties file remains unchanged.

This section describes how to enter material properties and analysis options. The next section describes how to create liquid properties files.

Perform the following steps to define an analysis conditions file.

1. Choose one of the following:
  - Select **File > Open > Analysis conditions**; the Open Analysis Conditions File dialog is displayed.
    - a. Enter a name in the **File name** field, then click **OK**. The file name may contain up to 8 alphanumeric characters (letters, numbers, and printable characters).

The following message is displayed:

**File [name] does not exist. Do you wish to create it?**

- b. Click **Yes**.
- In the Advanced Sample Information dialog, click the Material Properties tab.

The Material Properties dialog is displayed.

2. Enter a description in the **Description** field.



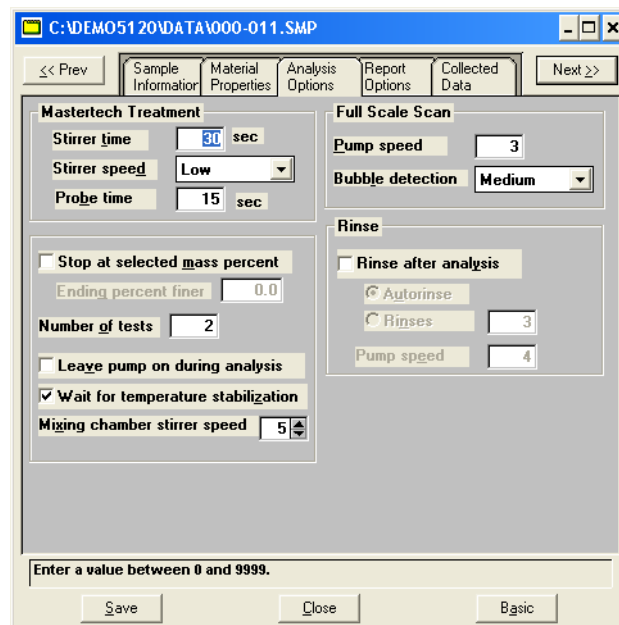
**Use an intuitive name that will help you identify the type of sample you plan to analyze using these analysis conditions. You may wish to use a name which contains the type of sample material and dispersing liquid. For example, Garnet/ Water.**

3. From the Sample Material list box, select the desired sample material. If your sample material does not appear in the list, perform the following steps to add it:
  - a. Enter the sample material you wish to use for these analysis conditions in the **Description** field.
  - b. Enter the material's density in the **Density** field.
  - c. Click **Add**; the sample material is added to the list.
4. From the Analysis Liquid list box, select the desired dispersing liquid. If your dispersing liquid does not appear in the list, perform the following steps to add it:
  - a. Enter the dispersing liquid you wish to use for these analysis conditions in the **Description** field.
  - b. Click **Properties** and enter the viscosity and density for the liquid.
  - c. Click **Add**; the dispersing liquid is added to the list.
5. Select whether you wish your analysis to be *Standard*, *High Resolution* or *High Speed*.

6. Enter the starting and ending diameters. Generally, the starting diameter should be larger than the largest particle you expect to be in the sample. The ending diameter must be less than the smallest size particle you are interested in.
7. Observe the following on the lower right side of the status display:
  - Maximum diameter: should be greater than the starting diameter specified in step 6.
  - Reynolds number: should be less than 0.3.

If...	Then...
The maximum diameter and Reynolds number values are not attained:	You <i>must</i> use a dispersing liquid with a higher viscosity.
The maximum diameter is much greater than the starting diameter and the Reynolds number is much less than 0.3:	A lower viscosity liquid (if available) may be used.

8. Now click the Analysis Options tab; the Analysis Options dialog is displayed.



9. If you have a MasterTech attached to your unit, enter the stirrer time, stirrer speed and probe time.
10. Select **Stop at selected mass percent** if you wish to stop the analysis at a specified mass percent finer, then enter the point at which you wish the analysis to stop.
11. Enter the number of tests (analyses) you wish to perform. You may enter up to 8.

12. Select **Leave pump on during analysis** if you wish to have the mixing pump operate during analysis. Coarse materials tend to settle in the tubing during analysis. Allowing the mixing pump to operate during analysis will make rinsing and resuspension more thorough.
13. Select **Wait for temperature stabilization** if you wish to have the temperature in the analysis compartment and mixing chamber stabilize before the analysis begins. Since liquid properties are defined from the analysis compartment temperature, analyses are more accurate if the mixing chamber and analysis compartment have the same temperature range.
14. Enter the speed at which you wish the cell pump to operate during the scanning process.
15. Choose whether you wish bubble detection to be for *Coarse*, *Medium*, or *Fine* samples.
16. Choose whether you wish to have the analysis cell rinsed after each analysis.
  - Select *Autorinse* to have the analysis cell rinsed automatically.
  - Select *Rinses* if you wish to specify the number of rinses.
17. Enter the pump speed at which you wish the pump to operate during the rinse operation.
18. Click **Save**, then **Close**.

The analysis conditions file you created will now appear in the predefined list of analysis conditions files on the Basic sample information window.

## Defining a Liquid Properties File

Liquid properties files provide certain physical characteristics of sedimentation liquids used for analysis. The physical characteristics are the density and viscosity of the liquid at different temperatures.



Refer to Appendix G **LIQUID DENSITY AND VISCOSITY DATA** for a list of some common dispersants and their density and viscosity values.

Liquid properties files can be created and used as often as needed. When you load one of these predefined files into a sample information file, you can then edit the properties as required without changing the original file.

Several liquid properties files, located in the PARAMS subdirectory, are included with the SediGraph 5120 analysis program.

Perform the following steps to define a liquid properties file:

1. Select **File > Open > Liquid properties**; the Open Liquid Properties dialog is displayed.
2. Enter a name in the **File name** field, then click **OK**. The file name may contain up to 8 alphanumeric characters (letters, numbers, and printable characters).

The following message is displayed:

**File [name] does not exist. Do you wish to create it?.**

3. Click **Yes**; the Liquid Properties dialog is displayed.

	Temp. °C	Density g/cm <sup>3</sup>	Viscosity mPa*s
1	25.0	1.1238	5.0410
2	30.0	1.1211	4.2470
3	35.0	1.1182	3.5400

4. Enter a description in the **Description** field.



5. Select one of the following:

- **Fixed values (ignore temperature)**

Enter values in the **Viscosity** and **Density** fields. These values will be maintained regardless of the cell temperature.

- **Interpolate using cell temperature**

Enter three sets of values for the temperature, viscosity and density. These values are used to interpolate the density and viscosity at the current cell temperature as long as the instrument operating temperature remains within these ranges.

The table requires that the entered values be properly ordered, Temperature in ascending order for example. Enter values from left-to-right and from top-to-bottom.

6. Select the X-ray intensity:

The *Normal* selection increases intensity when using high X-ray absorption liquids, such as water.

The *Low* selection decreases intensity when using low X-ray absorption liquids, such as hydrocarbons.

7. Click **Save**, then **Close**.

## Defining a Report Options File

Report options files specify the types of reports which can be generated from an analysis or from manually-entered data. They also contain details of the reports such as axis scale, axis range, and column headings. These report options files may be used to generate reports automatically at any time during or after the analysis. Of course, reports generated during analysis can only report on data collected up to the time of the report.

Report options files may be created and stored, then used with any sample information file. A report options file may contain tabular reports only, graphs only, or both tabular reports and selected graphs. It may also contain user defined report tables.

Report options files also may be defined to include overlay options. The SediGraph enables you to overlay up to seven graphs of different samples onto an eighth graph of the same type. The system also enables you to overlay one graph type onto a different graph type from the same sample analysis. For example, a cumulative mass graph may be overlaid with a mass frequency graph.

Several report options files, located in the PARAMS subdirectory, are included with the SediGraph 5120 analysis program.

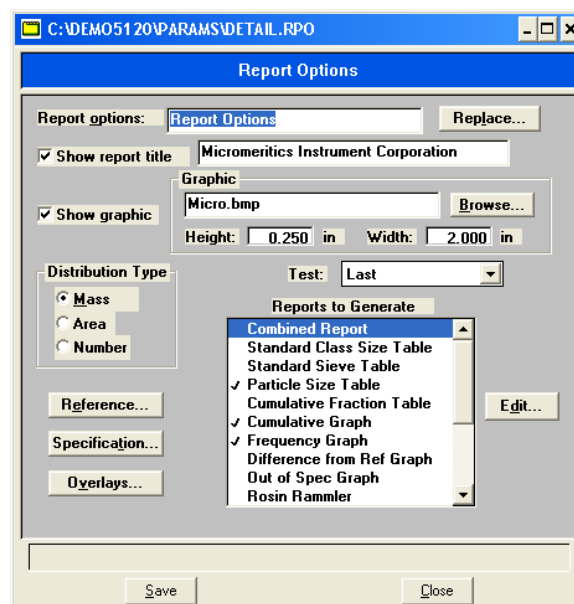
Perform the following steps to define a report options file.

1. Select **File > Open > Report options**; the Open Report Options dialog is displayed.
2. Enter a name in the **File name** field, then click **OK**. The file name may contain up to 8 alphanumeric characters (letters, numbers, and printable characters).

The following message is displayed:

**File [name] does not exist. Do you wish to create it?**

3. Click **Yes**; the Report Options dialog is displayed.



4. Enter a description in the **Report options** field. Enter an identifier which gives a more intuitive description of the files contents. For example, *Tabular Report using Mass Distribution*.
5. If you would like to enter a title to appear at the top of the report, click the **Show report title** box and enter the title.
6. If you would like to include a graphic in the header of the report:
  - a. Select **Show graphic**.
  - b. Enter the name of the graphic file or use the **Browse** button to select a file. The graphic file must be a bitmap (.bmp) or enhanced metafile (.emf) file.
  - c. Enter the height and width in which the graphic will appear in the report.
7. Choose whether you wish the data distribution to be reported as *Mass*, *Area*, or *Number*.
8. If you wish to compare analysis results for the current sample to those obtained for a reference sample, click **Reference** and choose a file. Results are reflected in the **Difference from Reference Graph** report.
9. If you wish to determine if the results for the current sample are within coarse and fine specifications, click **Specification** and choose a sample file for each boundary. Results are reflected in the **Out of Specification Graph** report.
10. If you wish to overlay graphs, click **Overlays** and choose the sample file(s) you wish to overlay with the current sample.
11. From the **Test** drop-down list, choose the analysis for which you wish to have a report generated. If you select *Average*, an average for all reports will be generated.
12. From the **Reports to Generate** list box, choose the reports you wish to have generated. A report is selected if it is preceded with a check mark. Remove any unwanted reports by highlighting the report, then double-click or press **Spacebar**. Or, you may add reports in the same manner.
13. Edit any reports you wish by highlighting the report, then clicking **Edit**.
14. Click **Save**, then **Close**.

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## Performing a Drain and Load Operation

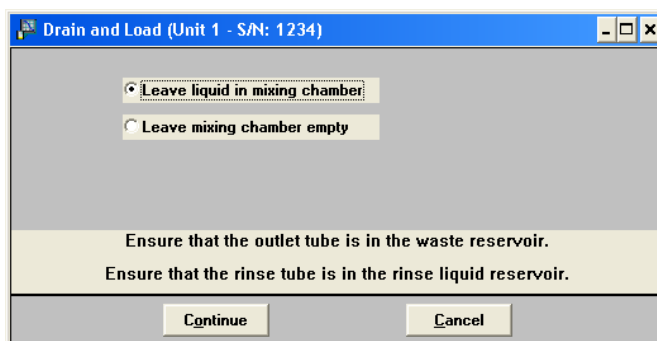
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Before you can collect baseline data or perform an analysis, the cell and mixing chamber must be drained and the sample (or baseline liquid) loaded. You may perform this operation using one of the following methods:

- *Prior to a baseline collection or an analysis*, select **Drain and load** from the Unit menu (the method explained in this section).
- *At the beginning of a baseline collection*, select the **Prepare SediGraph to load baseline liquid** check box on the Baseline Measurement dialog (refer to [“Performing a Baseline Measurement”](#) on page 3-32).
- *At the beginning of an analysis*, select the **Prepare SediGraph to load sample** check box on the Drain and Load dialog (refer to [“Performing an Analysis”](#) on page 3-34).

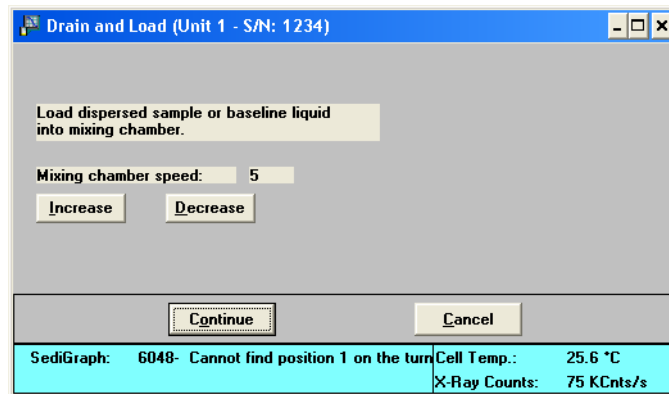
Perform the following steps to drain the cell and the mixing chamber, then load the sample (or baseline liquid) into the mixing chamber:

1. Ensure that the outlet tube is in the waste reservoir.
2. Ensure that the rinse tube is in the rinse liquid reservoir.
3. Select **Unit [n] > Drain and load**; the Drain and Load dialog is displayed.

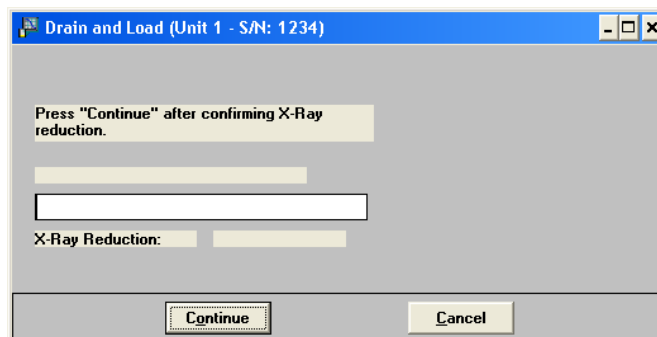


4. Choose whether you wish to have liquid remain in the mixing chamber or if you wish to leave the mixing chamber empty, then click **Continue**.

A progress message is displayed, then the dialog shown below displays.



5. Make sure the mixing chamber bezel is inserted in the mixing chamber, then load the sample (or baseline liquid) into the mixing chamber.
6. You may change the mixing speed if desired using the **Increase** or **Decrease** button.
7. Click **Continue**. The following dialog is displayed.



This dialog allows you to confirm the X-ray intensity reduction over the baseline before it completes.

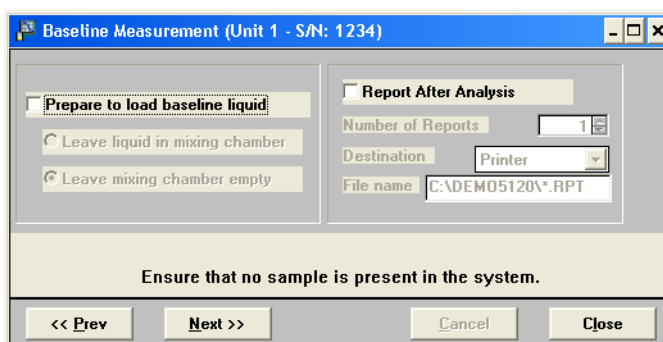
- If reduction is between 30 and 75%, *Good* is displayed. This indicates that the concentration level is appropriate.
  - If the reduction is less than 30%, *Low* is displayed. This indicates that the concentration is too low; sample should be added.
  - If the reduction is more than 75%, *High* is displayed. This indicates that the concentration is too high; more dispersant or less sample should be used.
8. When you are satisfied with the X-ray reduction level, click **Continue** and the cell will move to the normal park position and the load operation will be complete.

## Performing a Baseline Measurement

A baseline measurement is required for data collection. It is not necessary to measure a baseline for each analysis. Micromeritics recommends that you perform a baseline measurement once per shift and when you change dispersing agents. You may measure up to seven baselines; however, only the last one may be saved.

Perform the following steps to measure a baseline.

1. Ensure that no sample is present in the system.
2. Select **Unit [n] > Baseline**; the Baseline Measurement dialog is displayed.



3. If you have not loaded your baseline liquid into the mixing chamber:
  - a. Select *Prepare to load baseline liquid*.
  - b. Choose whether you wish to have liquid remain in the mixing chamber or if you wish to leave the mixing chamber empty.

 **If you plan to use a liquid *different* from the one you used for rinsing, leave the mixing chamber empty.**

4. If you wish to have a baseline report generated:
  - a. Select *Report After Analysis*.
  - b. Select the report destination.
  - c. If you selected *Printer*, enter the number of copies to be printed.

 **File cannot be specified as the destination for baseline reports. Only tabular reports can be output to a File.**

- Select the X-ray intensity setting.

The **Normal** selection increases intensity when using high X-ray absorption liquids, such as water.

The **Low** selection decreases intensity when using low X-ray absorption liquids, such as hydrocarbons.

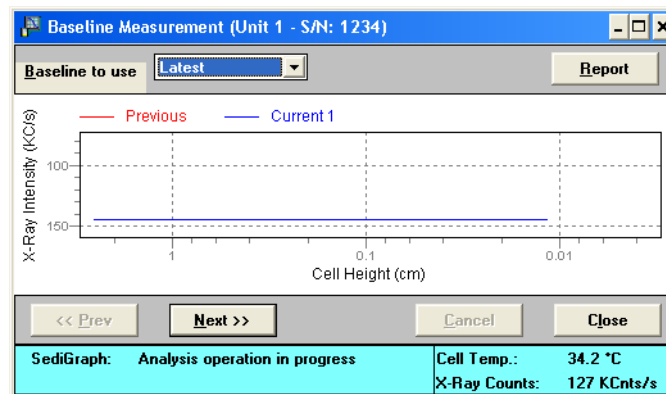
- Click **Next >**; a window containing the previous baseline is displayed. This window also

displays the new (current) baseline as it is measured.

**If you selected *Prepare to load baseline liquid*, a drain and load operation is performed first.**



**If this baseline is not satisfactory, you may perform another one by clicking Next >. If you do measure another baseline, this one will become inaccessible. You can only choose between the latest and previously saved baseline.**



- Note that the window now contains an upper status display. Click on the down arrow to the right of the **Baseline to use** field; choose *Latest* to use the current baseline or *Previous* to use the previously saved one, then Click **Close**.

---

## Performing an Analysis

---

There are five different ways in which an analysis (or analyses) may be performed:

- **Sample Analysis:** Used to perform a *single sample analysis*.
- **Quick Start Analysis:** Used to perform analyses on *multiple samples using the same analysis conditions*; sample files are generated automatically.
- **Repeat Analysis:** Used to perform *multiple analyses on the same sample*.
- **MasterTech Automatic:** Used to analyze a *series of samples of the same type with the same analysis conditions*. Functional only if a MasterTech is installed.
- **MasterTech Schedule:** Used to analyze a *series of samples which are different in size and shape* and, consequently, require different analysis conditions. Functional only if you have a MasterTech installed.

Choose the method you wish to use and proceed accordingly.



## Sample Analysis

Perform the following steps if you wish to perform an analysis on only one sample.

1. Select **Unit [n] > Sample Analysis**; the Sample Analysis dialog is displayed.
2. Click **Browse** and choose the sample file you wish to use with this analysis; all parameters associated with that file are displayed in the Sample Analysis dialog.

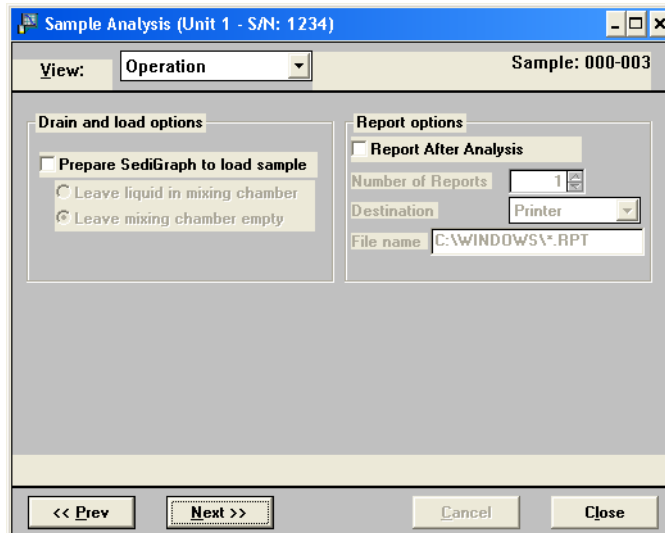
3. Ensure that the analysis conditions and report options are suitable; if not, you can select another analysis conditions or report options file to use.
4. In the **Full scale mass percent** field, enter the percentage of the sample you wish to be analyzed. Unless you plan to analyze a portion of the sample by some other method, this should be left at 100%.



**If you wish to merge data collected by another method with the data collected with this analysis, skip this step and proceed to the next one for instructions.**

5. If you wish to merge alternatively collected data with the data to be collected with this file, select *Merge with external data*.
  - a. Click **External Data...**; the External Data dialog is displayed.
  - b. Choose whether the external data is particle size or sieve size.
  - c. In the table, enter the data (particle size or sieve size) collected from the alternative method.

- d. Choose the type of distribution provided by the external analysis method.
  - e. Click **OK**.
6. Click **Next>>**; the following dialog is displayed.

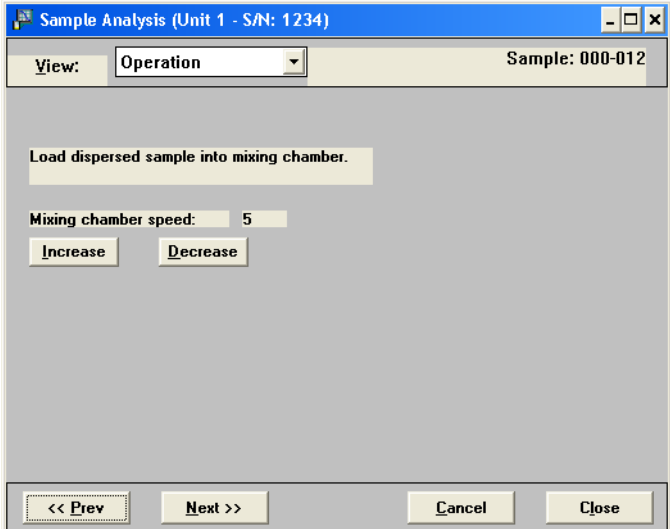


7. If you wish to have a report generated after analysis, check the **Report After Analysis** box and select a destination.

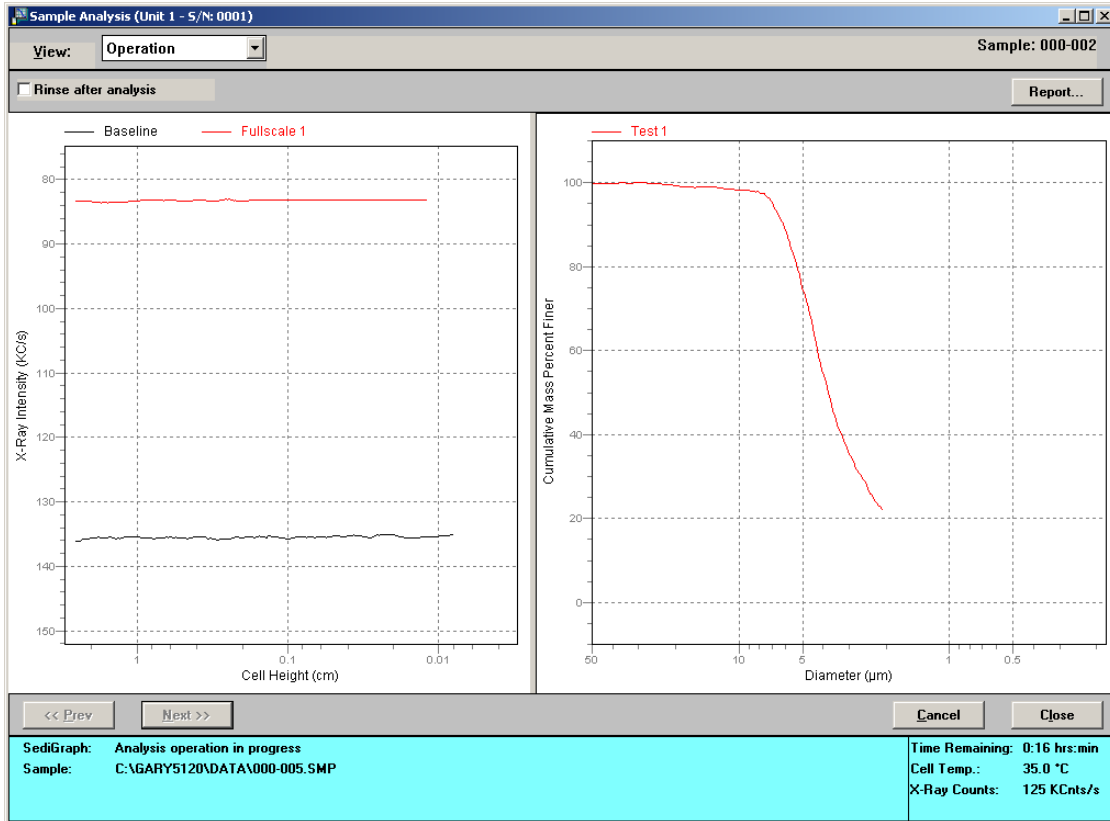
If you choose *File*, enter a name in the **File name** field (or accept the default).

If you choose *Printer*, enter the number of copies to be printed.

8. Choose one:

If...	Then...
<p>You have loaded your sample into the mixing chamber:</p>	<ol style="list-style-type: none"> <li>Ensure that <b>Prepare SediGraph to load sample</b> is deselected.</li> <li>Choose report output options if desired.</li> <li>Click <b>Next&gt;&gt;</b>.</li> </ol>
<p>If you have not loaded your sample:</p>	<ol style="list-style-type: none"> <li>Select <b>Prepare SediGraph to load sample</b>.</li> <li>Choose whether you wish to have liquid remain in the mixing chamber or to have the chamber left empty.</li> <li>Choose report output options if desired.</li> <li>Click <b>Next&gt;&gt;</b>; a drain operation is performed, then the following dialog is displayed.</li> </ol>  <ol style="list-style-type: none"> <li>Load your sample. If you want to change the mixing chamber speed, use the <b>Increase</b> or <b>Decrease</b> button.</li> </ol>
	<ol style="list-style-type: none"> <li>Click <b>Next</b>; a dialog indicating the Load operation is in progress is displayed.</li> </ol>

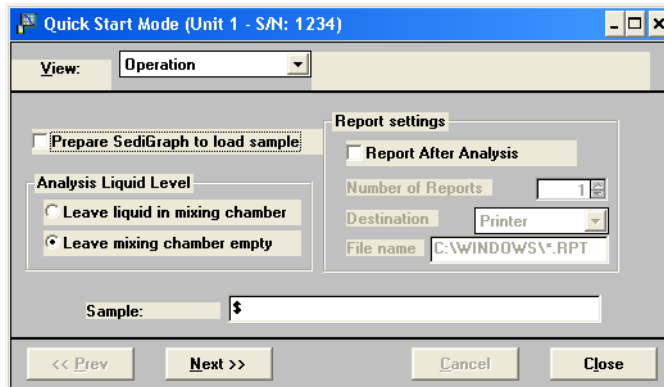
- 9. A dual-paned window is displayed. The left pane of the window contains the current baseline and full-scale scan. The right pane contains analysis data in progress.



## Quick Start

Perform the following steps if you wish to perform analyses on multiple samples using the same analysis conditions; sample information files are created automatically.

1. Select **Unit [n] > Quick Start**; the Quick Start dialog is displayed.

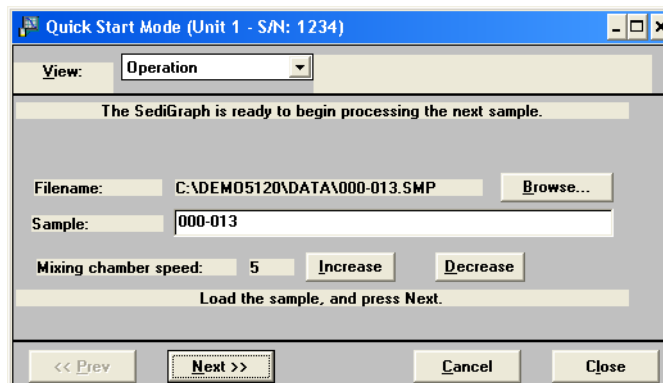


2. If the SediGraph has not been drained, select **Prepare SediGraph to load sample** to drain the mixing chamber. Then choose whether you wish to have liquid remain in the mixing chamber after the drain and load operation or if you wish to leave it empty.
3. If you wish to have a report generated after analysis, check the **Report After Analysis** box and select a destination.

If you choose *File*, enter a name in the **File name** field (or accept the default).

If you choose *Printer*, enter the number of copies to be printed.

4. If you wish to have a different identification string than the one specified in sample defaults for this series of samples, enter a new name in the **Sample** field. Be sure to retain the \$ symbol if you want the sample file number included as part of the identification.
5. Click **Next>>**; a dialog prompting you to load the sample is displayed.



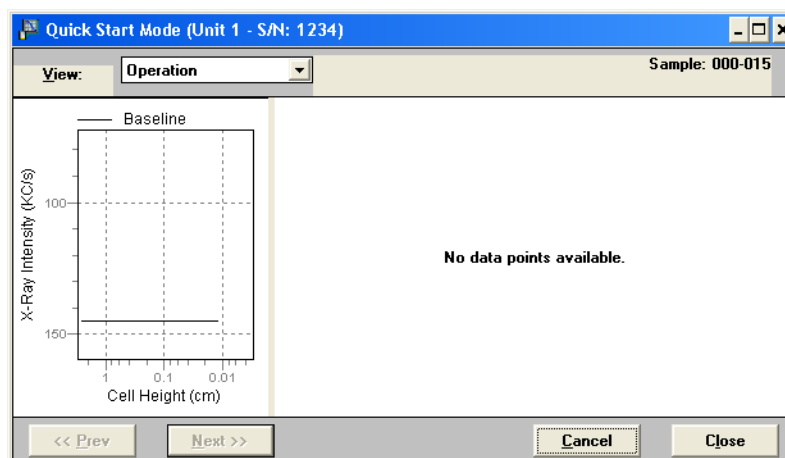


If you selected *Prepare SediGraph to load sample*, a drain is performed before you are prompted to load your first sample.



If you wish to analyze a sample requiring different analysis conditions from the ones established for this series of analyses, click **Browse**, then choose the sample file you wish to use. Once this sample is completed, all conditions revert back to the ones established for the Quick Start series.

6. Load the sample if you have not already done so.
7. If you wish to change the mixing chamber speed, use the **Increase** or **Decrease** button.
8. Click **Next>>**; analysis of the first sample begins. The current baseline and data as they are collected are displayed in the window.



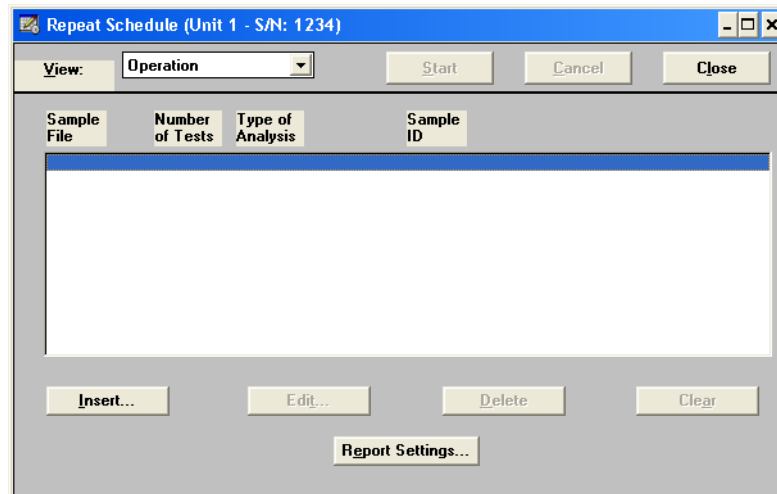
You may size either pane in the window by positioning the mouse pointer on the center vertical bar (separating the panes) and clicking the left mouse button. When the cursor changes to a 2-way arrow, pull the pane in the direction you desire.

9. When analysis is complete, a window prompting you to load the next sample is displayed. Repeat steps 6 through 8 until you have finished your analyses.

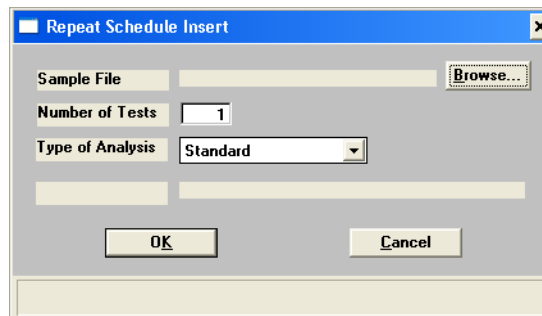
## Repeat Schedule

Perform the following steps if you wish to perform multiple analyses on the same sample.

1. Select **Unit [n] > Repeat Schedule**. The Repeat Schedule dialog is displayed.



2. Click **Insert**; the Repeat Schedule Insert dialog is displayed.



- a. Click **Browse** and choose the sample file you wish to use for the analysis.
  - b. Enter the number of tests (analyses) you wish to perform using this sample file.
  - c. Change the type of analysis if you wish.
  - d. Click **OK**.
3. Repeat step 2 for as many analyses you wish to perform using this sample.
  4. Click **Edit** if you wish to edit any file parameters of the selected file.
  5. Click **Report Settings** if you wish to have reports generated after each analysis.
    - a. Select a report destination.

If you choose *File*, enter a name in the **File name** field.

If you choose *Printer*, enter the number of copies to be printed.

- b. Click **OK**.
6. Click **Start** to begin the analyses.



**When the analysis begins, the Start button changes to Stop. The Stop button cancels the remaining analyses. The analysis that is currently in progress will be completed.**

## MasterTech Automatic



This option is functional only if you have a MasterTech connected to your analyzer.

Perform the following steps to analyze a series of samples of the same type, using the same analysis conditions. When you use this method, sample files, containing the default analysis conditions, are created automatically and used for all analyses.

1. Select **Unit [n] > MasterTech Automatic**; the MasterTech Automatic dialog is displayed.

2. In the **Start with beaker** field, enter the position number of the beaker containing the first sample you wish to analyze.
3. Enter the stirrer time, stirrer speed and probe time you wish to use for sample resuspension. Samples tend to settle in the beaker while waiting for analysis, especially if several samples are prepared ahead of time. This option allows you to redisperse samples



before analysis. Coarse materials and less stable dispersions may need a higher speed and more stirring and probe time than finer samples.

4. If you wish to have a report generated after analysis, check the **Report After Analysis** box and select a destination.

If you choose *File*, enter a name in the **File name** field.

If you choose *Printer*, enter the number of copies to be printed.

5. In the **Sample** field, enter a default string for this series of samples.



**You can have the beaker number containing the sample included in the sample identification by entering # within the name you specify. For example, *Garnet in beaker #*.**

6. Click **Start**; the analysis begins.



**When the analysis begins, the Start button changes to Stop. When you press Stop, the current analysis and the next queued analysis will be performed, then the remaining analyses in the queue will be canceled.**



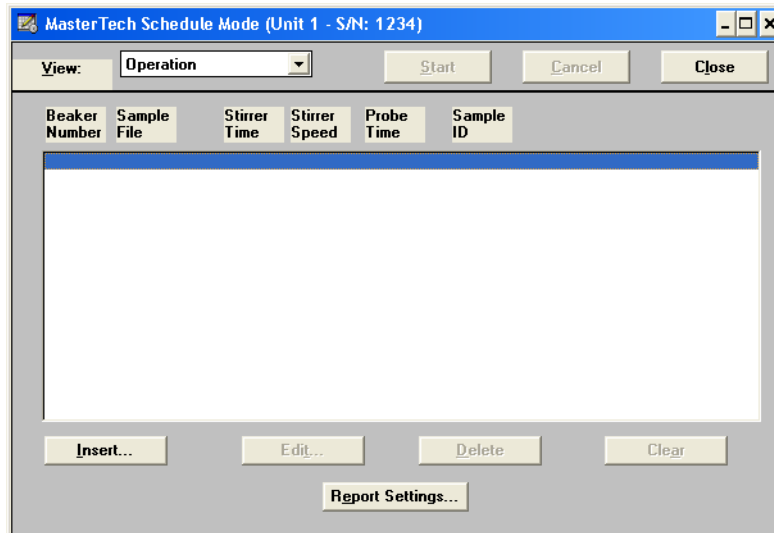
**If you wish to view the analyses in progress, select *Analysis Results* from the View drop-down list.**

## MasterTech Schedule

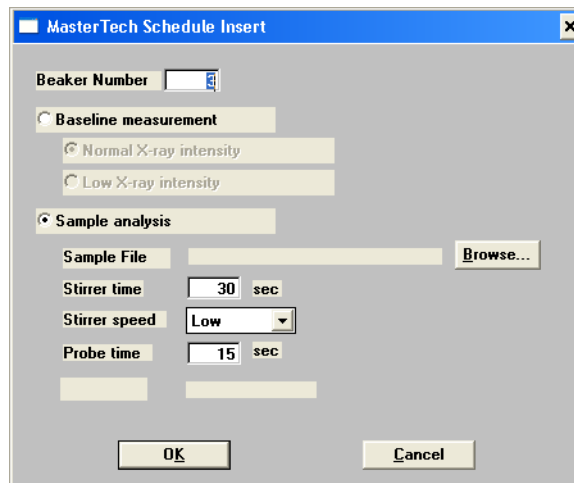
This mode of operation is used to analyze a series of samples that are different in size and shape and, consequently, require different analysis conditions. You also can schedule baseline measurements between samples.

Perform the following steps to use this mode of operation.

1. Select **Unit [n] > MasterTech Schedule**; the MasterTech Schedule dialog is displayed.



2. Click **Insert**; the MasterTech Schedule Insert dialog is displayed.



- a. Enter the position number of the beaker containing the current sample.
- b. Select **Sample analysis** or **Baseline measurement**.
  - If you select **Baseline measurement**, select the X-Ray intensity.

The **Normal** selection increases intensity when using high X-ray absorption liquids, such as water.

The **Low** selection decreases intensity when using low X-ray absorption liquids, such as hydrocarbons.

- If you select **Sample analysis**, click **Browse**, then choose the sample file you wish to use with the sample in this beaker position.

The values contained in the fields for Stirrer time, Stirrer speed, and Probe time are copied from the sample file you selected. You may change them if you wish.

- c. Click **OK**; the MasterTech Schedule dialog again is displayed. Note that the beaker information you just entered is shown in the list box.

3. Repeat step 2 for each beaker containing sample.

If you plan to change dispersing liquids at any time during this series, you should perform a baseline measurement using the beaker position preceding the one containing the sample with the new liquid. For example, if you change dispersing liquids with the sample contained in beaker position 4, insert a Baseline measurement for beaker position 3.

4. Click **Report Settings** if you wish to have reports generated after each analysis.

- a. Select a report destination.

If you choose *File*, enter a name in the **File name** field.

If you choose *Printer*, enter the number of copies to be printed.

- b. Click **OK**.

5. Click **Start** to begin the analyses.



**When the analysis begins, the Start button changes to Stop. When you press Stop, the current analysis and the next queued analysis will be performed, then the remaining analyses in the queue will be canceled.**



**If you wish to view the analyses in progress, select *Analysis Results* from the View drop-down list.**

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## Performing a Rinse Operation

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A rinse operation should be performed to rinse any debris or contaminants from the analysis cell. It is best to perform a rinse operation after each analysis. The Analysis Options dialog contains a choice that allows you to specify that a rinse be performed after an analysis (refer to [“Defining an Analysis Conditions File”](#) on page 3-22).

Alternately, you can choose **Rinse** from the main menu. When you choose **Rinse** from the main menu, three choices are presented:

- **SediGraph** - rinses the analysis cell, the mixing chamber, and the tubing
- **MasterTech** - rinses the MasterTech tubing into a specified beaker
- **Both** - rinses the analysis cell, the mixing chamber, and *all* tubing



**The rinse container should be rinsed thoroughly or replaced after each use.**

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## SediGraph

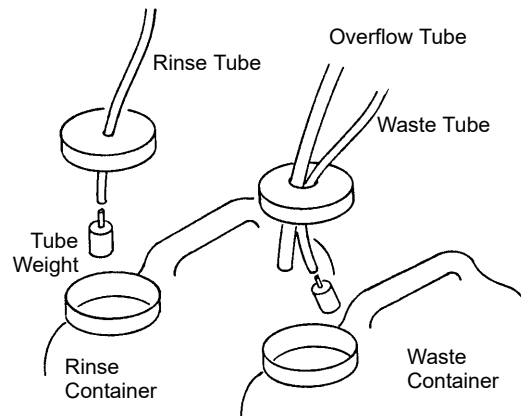
---

Perform the following steps to rinse the analysis cell and the tubing in the SediGraph:

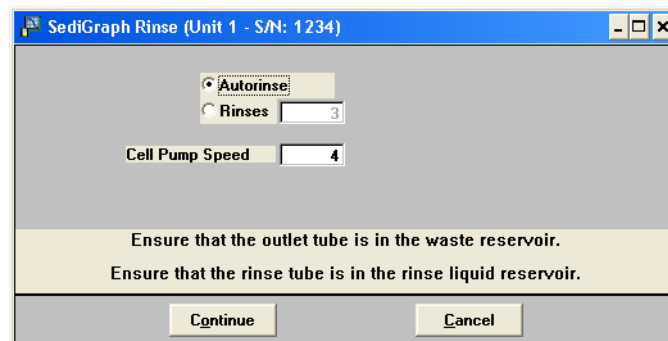
1. Pour approximately 10 liters of water containing a small amount of surfactant into the rinse container. For example, you may wish to use 0.05% sodium metaphosphate (W/W) in deionized water.
2. Insert the rinse tube into the rinse container. Insert the waste and overflow tubes into the waste container. Turn the caps clockwise to secure.



**Make sure that tube weights are attached to the rinse and waste tubes.**



3. Select **Unit [n] > Rinse > SediGraph**; the SediGraph Rinse dialog is displayed.



4. Choose one of the following:
  - *Autorinse* if you wish to have the analyzer automatically determine how many rinse cycles to perform.
  - *Rinses* if you wish to specify the number of rinses. If you select *Rinses*, enter the number of rinse cycles to be performed in the field next to the radio button.



***Autorinse*, in an effort to reestablish baseline conditions, performs three cycles of three rinses per cycle (default setting) before displaying an error message that baseline conditions cannot be reestablished.**

5. Enter the speed at which you wish the cell pump to operate. A speed of 2 usually is sufficient unless you find your material is difficult to rinse; then you may need to use a higher speed.
6. Click **Continue**; progress messages are displayed until rinsing is complete, then the dialog closes.

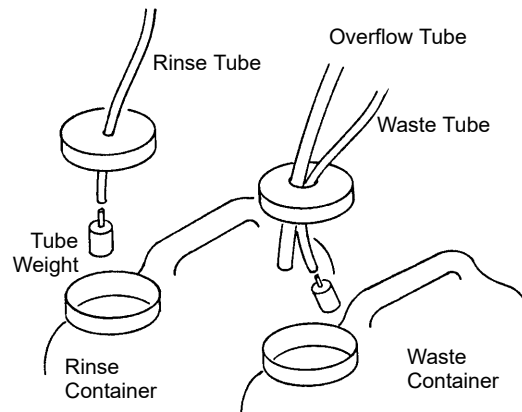
## MasterTech

Perform the following steps to rinse the MasterTech tubing:

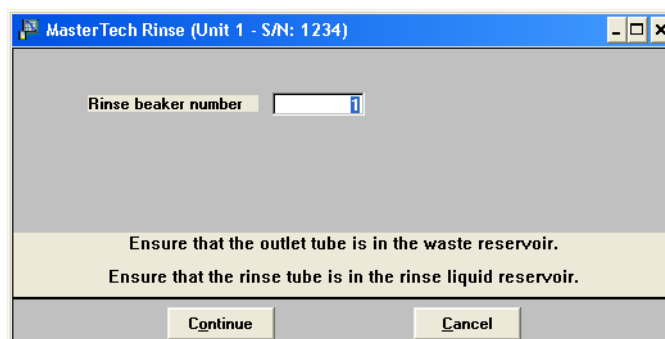
1. Pour approximately 10 liters of water containing a small amount of surfactant into the rinse container. For example, you may wish to use 0.05% sodium metaphosphate (W/W) in deionized water.
2. Insert the rinse tube into the rinse container. Insert the waste and overflow tubes into the waste container. Turn the caps clockwise to secure.



**Make sure that tube weights are attached to the rinse and waste tubes.**



3. Select **Unit [n] > Rinse > MasterTech**; the MasterTech Rinse dialog is displayed.



4. Enter the position number of the beaker you wish to catch the rinse liquid (make sure the beaker is empty).
5. Click **Continue**; progress messages are displayed until rinsing is complete, then the dialog closes.

## Both

Perform the following steps to rinse the analysis cell, the mixing chamber, and the tubing for the SediGraph and the MasterTech.

1. Pour approximately 10 liters of water containing a small amount of surfactant into the rinse container. For example, you may wish to use 0.05% sodium metaphosphate (W/W) in deionized water.
2. Insert the rinse tube into the rinse container. Insert the waste and overflow tubes into the waste container. Turn the caps clockwise to secure.



**Make sure that tube weights are attached to the rinse and waste tubes.**

3. Select **Unit [n] > Rinse > Both**; the SediGraph and MasterTech Rinse dialog box is displayed.

4. In the SediGraph box, choose one of the following:
  - *Autorinse* if you wish to have the analyzer automatically determine how many rinse cycles to perform.
  - *Rinses* if you wish to specify the number of rinses. If you select *Rinses*, enter the number of rinse cycles to be performed in the field next to the radio button.
5. In the MasterTech box, enter the position number of the beaker you wish to catch the rinse liquid (make sure the beaker is empty).
6. Click **Continue**; progress messages are displayed until rinsing is complete, then the dialog closes.

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## Generating a List

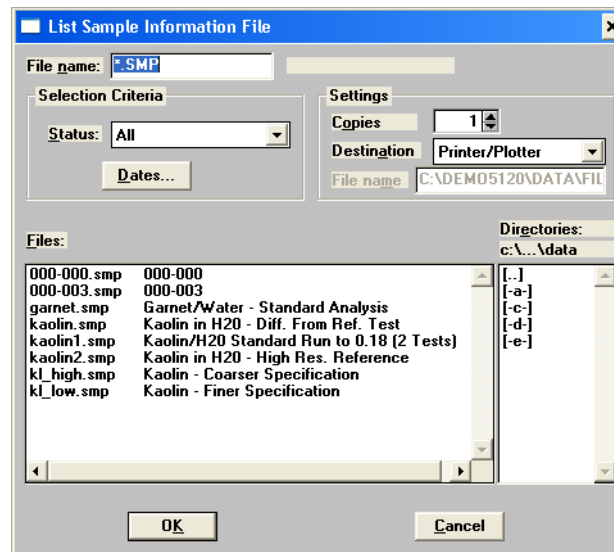
---

You can generate a list of the following information on one or more files:

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

Perform the following steps to generate a list:

1. Select **File > List**.
2. From the **List** drop-down menu, select the type of file on which you wish information. A dialog similar to the one shown below is displayed.



3. From the **Files** list box, choose the files you wish to include in the list by holding down **Ctrl** and clicking on the desired files. If you wish to include all files in the list, leave all files *deselected*.
4. At the **Destination:** field, click on the down arrow and choose a destination for the list output. If you choose *File* as the destination, enter a name in the **File name** field.
5. Click **OK**, a list for the requested files is sent to the specified destination.

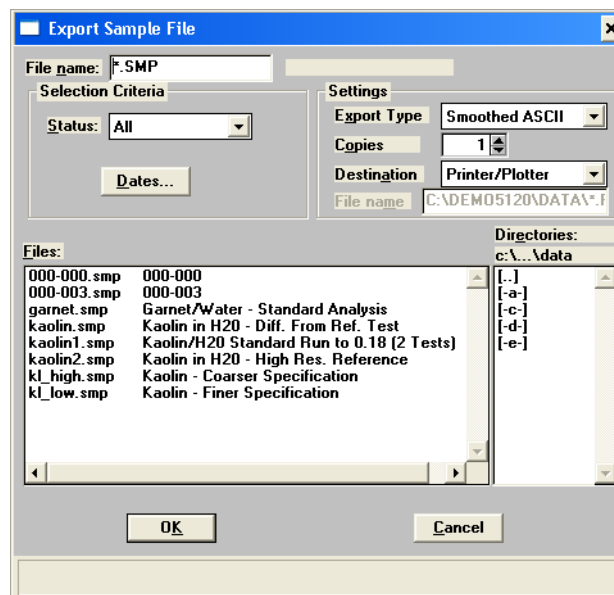


## Exporting a Sample Information File

The tabular data from a sample information file can be copied and exported as unreduced data in ASCII format. This data may be exported in a smoothed form (as used in reports) or an unsmoothed form (as collected by the instrument). Refer to **Appendix J DATA REDUCTION** for a description of the smoothing technique. If exported and saved as a *file*, the data can be imported into applications (such as spreadsheets) accepting ASCII format. Refer to **Appendix K SEDIGRAPH X-RAY SAFETY INFORMATION** for exporting format.

Perform the following steps to export a sample information file in ASCII format:

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



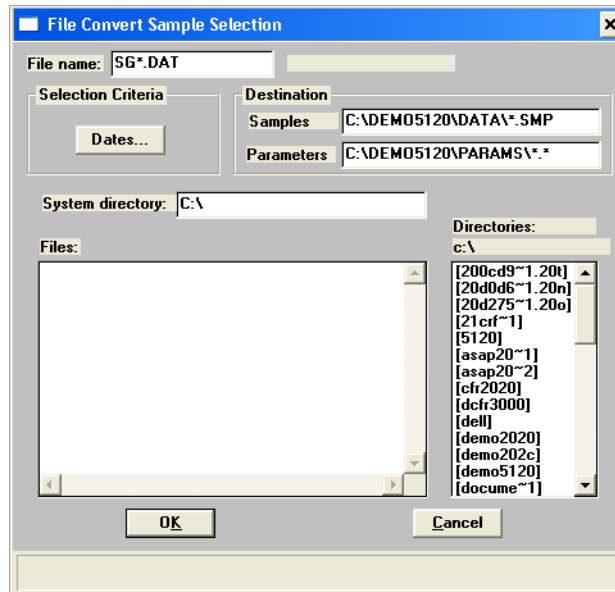
2. From the **Files** list box, choose the files you wish to export by holding down and clicking **Ctrl** on the desired files.
3. From the **Settings** group box:
  - a. Choose whether you wish the data to be exported as *Smoothed* or *Unsmoothed* data.
  - b. Choose a destination for your exported file. If you choose *File* as the destination, enter a name in the **File name** field. If you choose *Printer* or *Printer/Plotter* enter the number of copies to be printed.
4. Click **OK**, the requested file is exported and sent to the specified destination.

## Converting Non-Windows Sample Files

You can convert a sample information file created with the non-Windows version of the SediGraph analysis program to a file that is compatible with Windows.

Perform the following steps to convert a sample information file:


1. From the **File** menu, select **Convert**; the File Convert Sample Selection dialog is displayed.



2. Using the **Directories** list box, navigate to the location where the non-Windows data files are stored.
3. From the **Files** list box, choose the files you wish to convert by holding down **Ctrl** and clicking on the desired files.

 **If you wish to display only files created within a designated time frame, click **Dates** and specify a date range.**

4. You are not required to enter anything in the **Samples:** and **Parameters:** fields unless you wish to change the name or directory.

 **As sample files are converted, the liquid properties and user-defined report tables they reference also are converted. The **Parameters:** field gives the destination for the converted parameter files.**

5. In the **System directory** field, enter the source directory of the non-windows parameter files.

Two types of parameter files are associated with a non-Windows sample file: Liquid Properties and User-Defined Report Tables. These files are required for a complete conversion. If you fail to enter a directory in this field, the conversion proceeds but all files may not be found. A warning message is displayed in the **Status** window if parameter files are not found.

6. Click **OK**; a window is displayed reporting the status of the conversion. If the conversion was unsuccessful, possible reasons are given.



**You may stop a conversion in process by selecting Close.**

7. Select the system menu in the upper left corner and then **Close** to close the status window, or you may press **Ctrl** and **F4**.

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## Generating Reports

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The following types of reports are available with the SediGraph 5120 analysis program:

- Tabular
- Graphical
- Baseline
- Statistical process control
- Overlays

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## Entering a Report Title

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The report dialogs contain a **Show report title** check box and data entry field, shown below, which enable you to enter a title to be included in the report header.


A screenshot of a software dialog box. On the left, there is a checked checkbox labeled "Show report title". To its right is a text input field containing the text "Micromeritics SPC Report". The text in the field is highlighted in blue.

If you would like to include a title in the report header:

1. Click the **Show report title** box to insert a check mark. You can also deselect the Show report title option by clicking the box to remove the check mark.
2. Enter the title in the field next to the check box. You may enter up to 40 characters.

## Including a Graphic in the Report Header

The report dialogs contain a **Graphic** group box, which enables you to select a graphic file to be included at the top of the report header. You may, for example, choose to include your company logo as shown in the following example.

 Micromeritics Instrument Corporation			
DEMO SediGraph III V1.00	Unit 2	Serial Number: 0003	Page 1
Sample: Calcium Carbonate Reference Material Operator: Submitter: File: C:\DEMO5120\DATA\CACO3.SMP Material/Liquid: CaCO3 / Water Measurement Principle: X-Ray monitored gravity sedimentation Calculation Method: Stokes sedimentation and Beer's law of extinction			
Test Number: 1	Analysis Type: High Speed		
Analyzed: 8/22/2003 4:54:07PM	Run Time: 0:31 hrs:min		
Reported: 10/31/2003 1:43:49PM	Sample Density: 2.730 g/cm <sup>3</sup>		
Liquid Visc: 0.7228 mPa-s	Liquid Density: 0.9941 g/cm <sup>3</sup>		
Analysis Temp: 35.0 °C	Base/Full Scale: 136 / 63 kCnts/s		
Full Scale Mass: 100.0 %	Reynolds Number: 0.22		

The Graphic group box, shown below, enables you to select the graphic and its size.

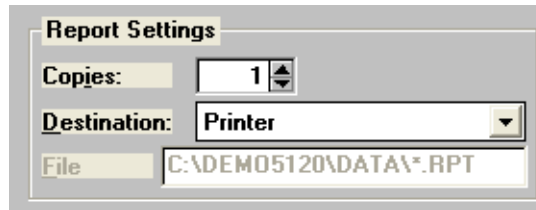
Graphic	
<input checked="" type="checkbox"/> Show graphic	<input type="text" value="miclogo.emf"/> <input type="button" value="Browse..."/> Height: <input type="text" value="0.250"/> in Width: <input type="text" value="2.000"/> in

If you would like to include a graphic in the report header:

1. Click the **Show graphic** box to insert a check mark. You can also deselect the Show graphic option by clicking the box to remove the check mark.
2. Enter the name of the graphic file or use the **Browse** button to select a file. The graphic file must be a bitmap (.bmp) or enhanced metafile (.emf) file.
3. Enter the height (in inches) at which the graphic will appear in the report in the **Height** field.
4. Enter the width (in inches) at which the graphic will appear in the report in the **Width** field.

## Selecting the Report Destination

The report dialogs contain a Report Settings group box, which enables you to select the report's destination.



The screenshot shows a dialog box titled "Report Settings". It has three main sections: "Copies" with a numeric input field set to "1" and a small up/down arrow button; "Destination" with a dropdown menu currently showing "Printer"; and "File" with a text input field containing the path "C:\DEMO5120\DATA\\*.RPT".

Choose the report's destination from the **Destination** drop-down list. The choices are *Printer*, *Printer/Plotter*, *Screen* or *File*.

### Printer or Printer/Plotter

This option prints up to four copies of a report on a printer or plotter.

If you choose *Printer* or *Printer/Plotter* as the destination, select the number of copies to be printed in the **Copies** field. The report is sent to the default printer.

*Range: 1 to 4*



**If you wish to change the default printer, select Options > System Configuration, then choose a printer.**

### Screen

This option displays a report on the screen.

While viewing the report, you can also print it if desired. (Refer to [Reports Displayed on the Screen](#) in Chapter 7).

**File**

This option saves a report to a file on your computer. The file includes column headers and report data. Columns are tab-delimited, allowing easy alignment when imported into another program.

If you choose *File* as the destination, enter a file name or accept the default value in the **File** field.

If you accept the default, when files are created, they are named as described below:

**For standard sample file reports:**

Each report will include the name of the sample file selected for the report and the .RPT extension.

**For baseline reports:**

The file name will include the instrument's serial number and the .RPT extension

**For SPC reports:**

The file name will include the name of the first sample file selected for the report and the .RPT extension.



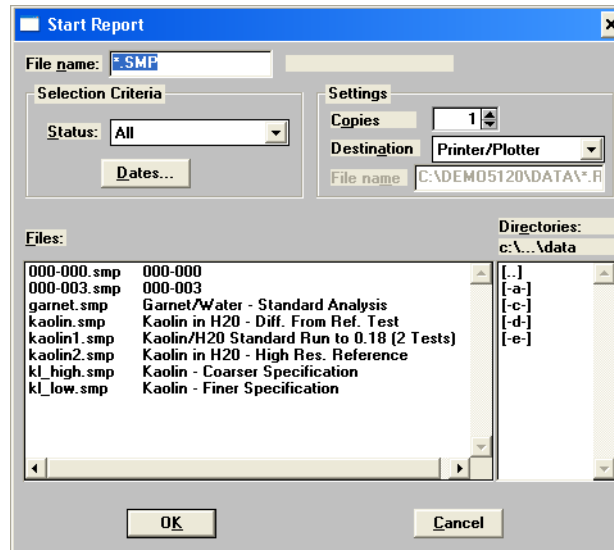
**If the report is a graph, only the data on the graph are included in the file, the graphical elements (X- and Y-axes representation and curves) are not.**

## Tabular and Graphical Reports

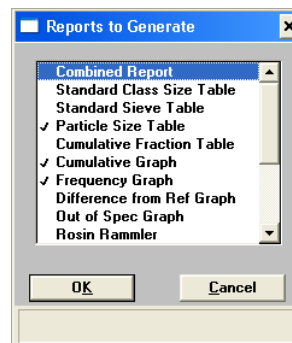
Tabular and graphical reports are generated automatically (if requested) after an analysis. If you wish to print additional copies, or change parameters and then reprint, you also may generate them manually.

Perform the following steps to generate reports manually.

1. From the **Reports** menu, select **Start report**; the Start Report dialog is displayed.



2. From the **Files** list box, click on the name of the file(s) for which you wish to have reports generated.
3. Select the destination in the **Settings** group box (refer to [“Selecting the Report Destination”](#) on page 3-55).
4. Click **OK**; the Reports to Generate dialog is displayed.



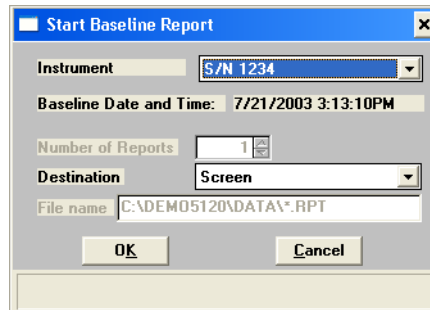
5. Select the report(s) you wish to generate. A report is selected when it is preceded by a check mark. Reports may be selected (or deselected) by double-clicking (or pressing the **Spacebar**) on the desired report.
6. Click **OK**; the selected reports are generated and sent to the specified destination.

## Baseline Reports

A graphical report can be generated on an instrument's baseline. This report generates a graph illustrating the X-ray intensity versus the cell height. The header of this report also contains baseline statistics, such as the unit serial number, date the baseline was performed, etc.

Perform the following steps to generate a baseline report.

1. Select **Reports > Baseline**; the Start Baseline Report dialog is displayed.



2. From the **Instrument** drop-down list, select the instrument on which you wish to have the baseline report generated.
3. Select the destination (refer to [“Selecting the Report Destination”](#) on page 3-55).
4. Click **OK**; the baseline report is generated and sent to the specified destination.



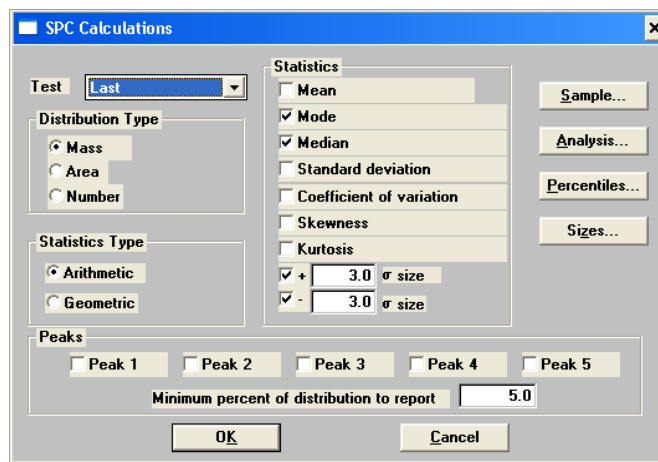
## Statistical Process Control Reports

Statistical process control (SPC) reports allow you to maintain control of a manufacturing process.

There are two types of SPC reports: Regression and Control Chart. Before you can generate either report, you must specify the calculation parameters to be used. These selections determine what values are available for SPC reporting. For efficiency, it is best to choose only the variables you actually intend to use, since all variables selected are computed for each sample file used in an SPC report.

Perform the following steps to specify calculation parameters:

1. Select **Reports > SPC report options**; the SPC Calculations dialog is displayed.



2. From the **Test** drop-down list, click the analysis on which you wish to report. If you select *Average*, an average of all analyses for the specified sample file is reported.
3. Select the type of distribution you wish to apply.
4. Select whether you wish to have arithmetic (linear) or geometric (logarithmic) type of statistics.
5. From the Statistics group box, select the statistics you wish to be included in SPC reporting.
6. Click **Sample** to choose the sample parameters you wish to report.
7. Click **Analysis** to choose the analysis conditions you wish to report.
8. Click **Percentiles** to specify the diameters for corresponding percentiles.
9. Click **Sizes** to specify percentiles for the corresponding diameters.
10. Choose the peaks to include in the SPC calculations; you can choose up to five. Use the field below to enter the minimum percentage of the distribution to report.
11. Click **OK** to save these options.

## Regression Report

Perform the following steps to generate a regression report.

1. Select **Reports > Regression report**; the Regression Report Options dialog is displayed.

2. Select whether you want to show the report title and enter a title if you wish.
3. Select whether you would like to include a graphic in the report header. (Refer to [“Including a Graphic in the Report Header”](#) on page 3-54.)
4. Select your X- and Y-axes variables.

**The variables displayed in these drop-down lists are the ones specified in SPC report options.**



5. Deselect **Autoscale** if you do not wish to have data scaled automatically; then enter the desired ranges.
6. Select **Tabular** if you wish to have a table, as well as graphical data, of the included samples generated.
7. Select **Label data** to have the points on the graph correspond with the sample files from which they came.
8. Click **Samples** to choose the files you wish to have reported.

9. Select **Recalculate archived SPC results** if you wish to have the SPC statistics recalculated for each of the included sample files. You may wish to use this option when a statistic you have selected is labeled N/A (not available) on the tabular report.
10. Select the destination in the **Report Settings** group box (refer to [“Selecting the Report Destination”](#) on page 3-55).



You can click **Save as Default** if you wish to have the selected options become the defaults for Regression reports.

11. Click **Report**; the regression report is generated and sent to the specified destination.

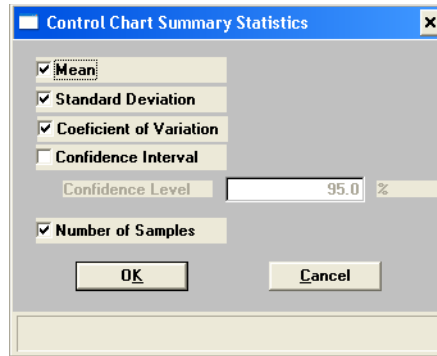
## Control Chart Report

Control chart reports can be generated to illustrate process variations. Perform the following steps to generate a control chart.

1. Select **Reports > Control chart**; the Control Chart Options dialog is displayed.

2. Select whether you want the report to include a title and enter a title if desired.
3. Select whether you would like to include a graphic in the report header. (Refer to [“Including a Graphic in the Report Header”](#) on page 3-54.)
4. Choose whether you wish to have files listed in order by file name or by the time they were created.

5. If you wish to edit the summary statistics displayed in the report, click **Summary Statistics**. The Control Chart Summary Statistics dialog is displayed.



- a. Check the statistics you want to display in the report. You may select:
    - *Mean*
    - *Standard Deviation*
    - *Coefficient of Variation* - the Standard Deviation divided by the Mean
    - *Confidence Interval* - the confidence interval of the mean value shown on the same line below the graph on the report
  - b. If you selected *Confidence Interval*, enter the percent in the **Confidence Level** field.
  - c. If you wish to have the number of samples analyzed included in the report, check the **Number of Samples** box.
  - d. Click **OK** to save your selections and close the dialog.
6. Click **Graph [n]** to select Y-axis labels.
  7. Select **Tabular report** if you wish to have tabular, as well as graphical, data generated.
  8. Select **Recalculate archived SPC results** if you wish to have the SPC statistics recalculated for each of the included sample files. You may wish to use this option when a statistic you have selected is labeled N/A (not available) on the tabular report.
  9. Click **Samples** to choose the files you wish to have reported.
  10. Select the destination in the **Report Settings** group box (refer to [“Selecting the Report Destination”](#) on page 3-55).

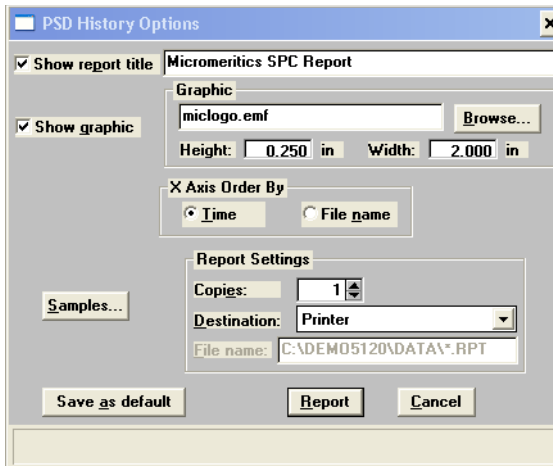
 You can click **Save as Default** if you wish to have the selected options become the defaults for Control Chart reports.

11. Click **Report**; the control chart report is generated and sent to the specified destination.

## PSD History

The PSD History option enables you to report a sequence of full particle size distribution graphs.

1. Select **Reports > PSD History**; the PSD History Options dialog is displayed.



2. Select whether you want the report to include a title and enter a title if desired.
3. Select whether you would like to include a graphic in the report header (refer to [“Including a Graphic in the Report Header”](#) on page 3-54).
4. Select whether to order the X axis by time or file name.
5. Click **Samples** to select the files to include in the report.
6. Select the destination in the **Report Settings** group box (refer to [“Selecting the Report Destination”](#) on page 3-55).
7. Click **Report**; the PSD report is generated and sent to the specified destination.

## Generating Overlays

Use the overlay function when you wish to compare multiple graphs. Overlays may be generated in three ways:

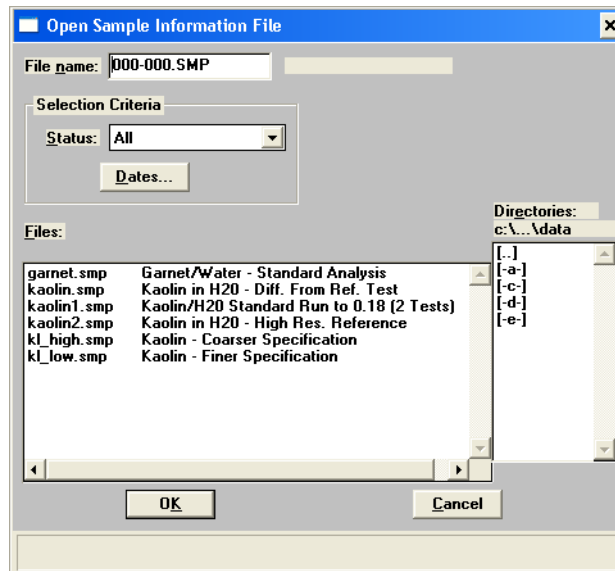
- from the same sample file, you can overlay multiple graphs.
- from multiple sample files, you can overlay the same type of graph(s).
- from the same sample file, you can overlay the same type of graph for all analyses (tests) for which you used this sample file.

Varying symbols are used to differentiate the graphical lines and reported in a legend at the top of the output. If color output is available, different colors are used instead.

It is much easier to generate overlays if you have predefined report options files created for specific overlay functions. For example, if you frequently compare Out of Specification graphs, define a report options file containing the desired options and assign an identification such as Out of Spec Overlays. Then you can use **Replace** to load the predefined file into the sample file. You do not have to save the file to have overlays generated, so the report options for your original sample file remain intact.

### To overlay multiple graphs from the same sample file:

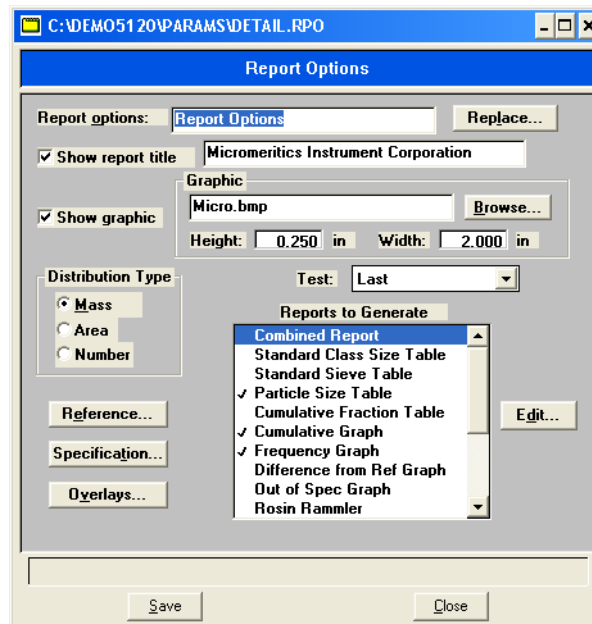
1. Select **File > Open, Sample information**; the Open Sample Information dialog is displayed.



2. Select the file you wish to use, then click **OK**. The Sample Information dialog displays.

If your window is presented in Basic format, click **Advanced** to display the Advanced format window.

3. Select the Report Options tab; the report options dialog is displayed.



4. Use one of the following methods:

If...	Then...
You are using a predefined Report Options file:	Click <b>Replace</b> and choose the report options file you wish to use.
You are defining report options:	<ol style="list-style-type: none"> <li>Select which test you wish to use.</li> <li>In the Reports to Generate list box, select the graph(s) you wish to overlay with other graph(s).</li> <li>Click <b>Edit</b> for each requested graph; a Graph Options dialog is displayed.</li> <li>From the <b>Overlay</b> drop-down list, choose the type of graph you wish to overlay; then click <b>OK</b>.</li> </ol>



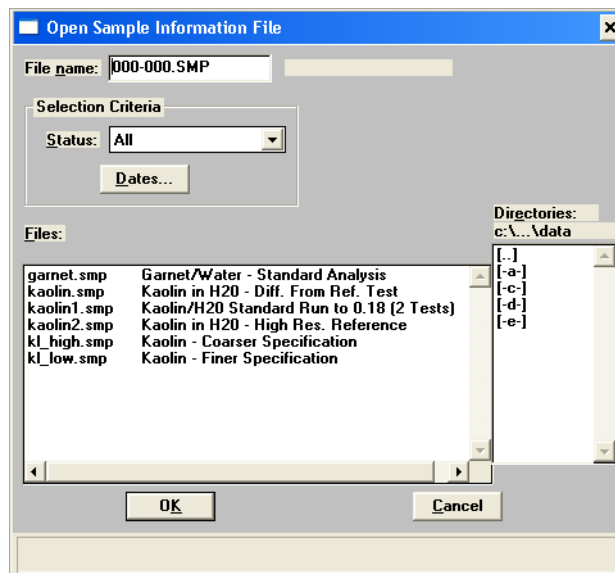
**You do not have to save these options before generating overlay reports. If you do save, the report options for your original sample file will be replaced with the new ones.**

5. From the **Reports** menu, select **Start report**; the Start Report dialog is displayed. The sample information file you chose in step 2 will be highlighted in the **Files** list.

6. Select a destination (refer to “[Selecting the Report Destination](#)” on page 3-55).
7. Click **OK**; the Reports to Generate dialog is displayed, allowing you to change report selections if you wish.
8. Click **OK**; requested overlays are generated and sent to the specified destination.

### **To overlay the same type of graph(s) for multiple samples:**

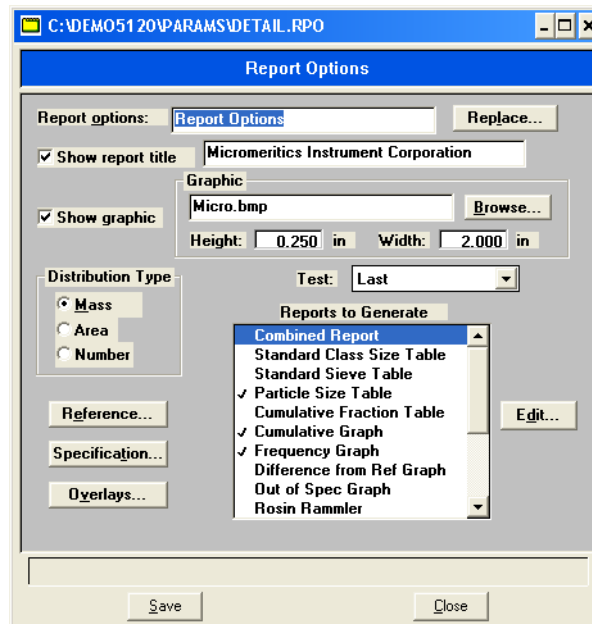
1. Select **File > Open, Sample information**; the Open Sample Information dialog is displayed.



2. Select the file you wish to use, then click **OK**. The Sample Information dialog displays. If your window is presented in Basic format, click **Advanced** to display the Advanced format window.



3. Select the Report Options tab; the Report Options dialog is displayed.



4. Use one of the following methods:

If...	Then...
You are using a predefined Report Options file:	Click <b>Replace</b> and choose the report options file you wish to use.
You are defining report options:	<ol style="list-style-type: none"> <li>From the <b>Test</b> drop-down list, select the test (analysis) of this sample file for which you wish to have results reported.</li> <li>The graph(s) you select for this report will be overlaid with the corresponding graph(s) of the test designated in the Report Options file(s) of the sample file(s) you select in step 7.</li> <li>In the Reports to Generate list box, select the graph(s) you wish to overlay.</li> <li>Click <b>Edit</b> for each selected report; a Graph Options dialog is displayed</li> <li>Ensure that <i>Samples</i> is selected in the <b>Overlay</b> field.</li> <li>Click <b>OK</b>; the Report Options dialog again is displayed.</li> </ol>

5. Click **Overlays**; the Graph Overlay Sample dialog is displayed.
6. Click **Browse**; the Graph Overlay Sample File Selection dialog is displayed.
7. Choose the file you wish to use; then click **OK**. You may choose up to eight files in this manner.

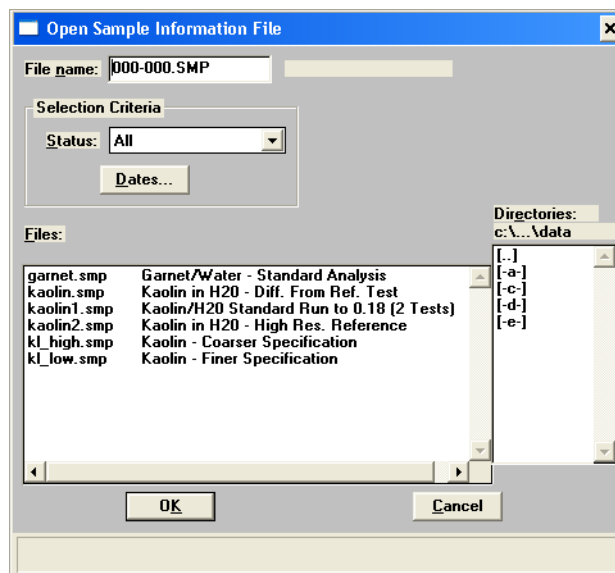


**You do not have to save these options before generating overlay reports. If you do save, the report options for your original sample file will be replaced with the new ones.**

8. From the **Reports** menu, select **Start report**; the Start Report dialog is displayed. The sample information file you chose in step 2 will be highlighted in the **Files** list.
9. Select a destination, refer to [“Selecting the Report Destination” on page 3-55](#).
10. Click **OK**; the Reports to Generate dialog is displayed, allowing you to change report selection if you wish.
11. Click **OK**; requested overlays are generated and sent to the specified destination.

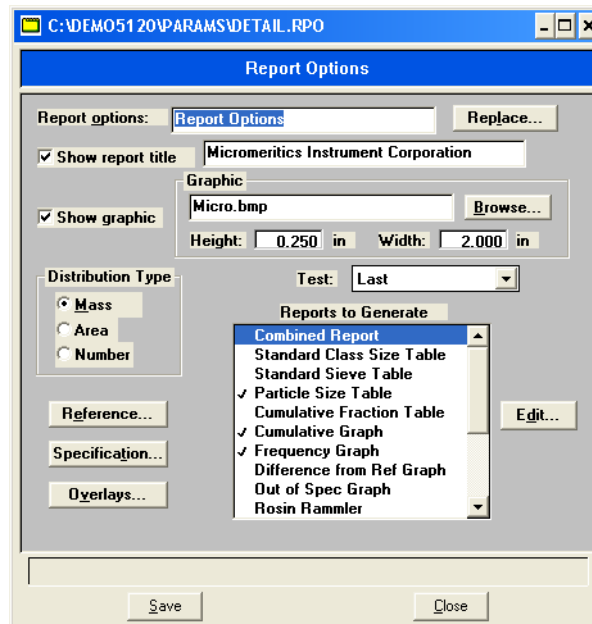
### **To overlay the same type of graph for all tests from the same sample file:**

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



2. Select the file you wish to use, then click **OK**. The Sample Information dialog is displayed. If your window is presented in Basic format, click **Advanced** to display the Advanced format window.

3. Select the Report Options tab; the report options dialog is displayed.

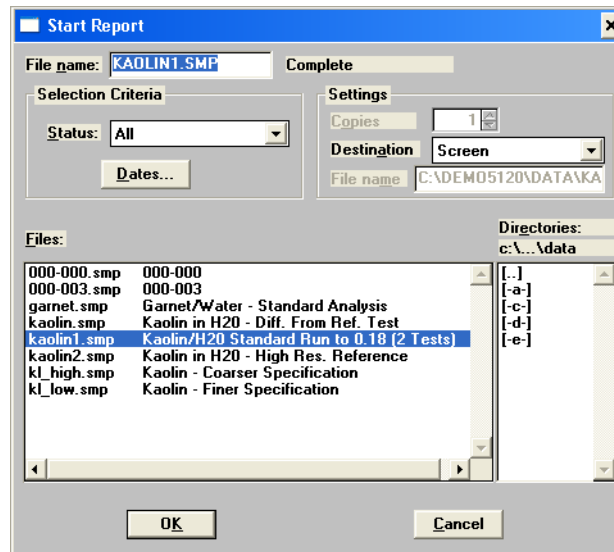


If...	Then...
You are using a predefined Report Options file:	Click <b>Replace</b> and choose the report options file you wish to use.
You are defining report options:	<ol style="list-style-type: none"> <li>In the <b>Reports to Generate</b> list box, select the graph(s) you wish to overlay.</li> <li>Click <b>Edit</b> for each selected report; a Graph Options dialog is displayed.</li> <li>Ensure that <i>Tests</i> is selected in the <b>Overlays</b> field.</li> <li>Click <b>OK</b>; the Report Options dialog again is displayed.</li> </ol>



You do not have to save these options before generating overlay reports. If you do save, the report options for your original sample file will be replaced with the new ones.

- From the **Reports** menu, select **Start report**; the Start Report dialog is displayed. The sample information file you chose in step 2 will be highlighted in the **Files** list.



- Select a destination, refer to [“Selecting the Report Destination”](#) on page 3-55.
- Click **OK**; the Reports to Generate dialog is displayed, allowing you to change report selections if you wish.
- Click **OK**; requested overlays are generated and sent to the specified destination.

## 4 SOFTWARE AND SETUP MODIFICATIONS

Overview	4-3
Installing the 5120 Analysis Program	4-4
Changing the Application Setup	4-8



## Overview

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Initially, your SediGraph 5120 will be installed and verified for operation by an authorized Micromeritics service representative or a representative of a Micromeritics distributor.

This chapter contains instructions for installing the 5120 software should you want to install the software on a computer other than the one controlling the analyzer. When you install the software on another computer you can create or edit sample and parameter files, and generate reports on sample files on that computer.

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

This chapter also contains instructions for installing software updates and changing the 5120 application setup.

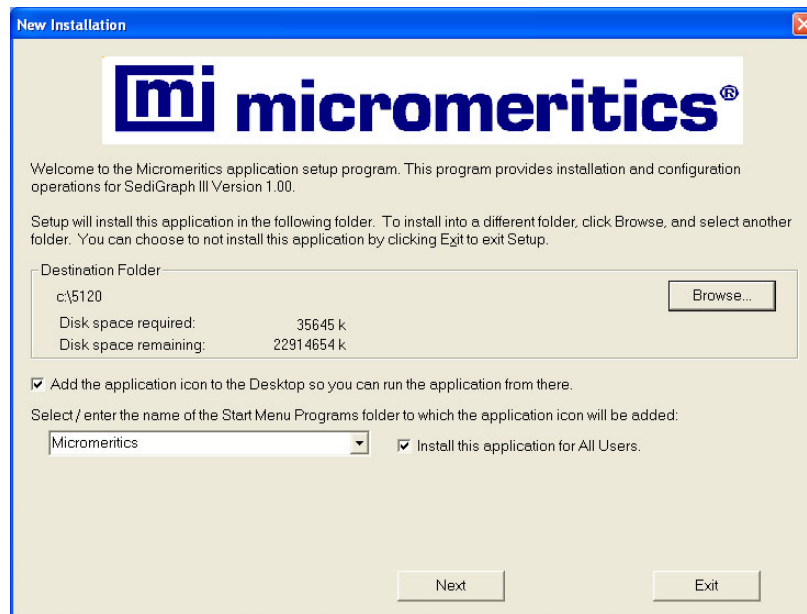
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## Installing the 5120 Analysis Program

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The installation CD shipped with the analyzer contains the 5120 analysis software. To install the software:

1. Insert the Micromeritics 5120 analysis software CD into your CD-ROM drive.
2. Select **Start** from the Status bar, then **Run** from the Start menu.
3. Enter the name of the drive designator, followed by **setup**. For example: **e:\:setup**.
4. Click **OK**; the New Installation dialog is displayed.



 You may cancel the installation at any time by selecting **Exit**. If you do so, you must start the installation program from the beginning to install the Micromeritics software.

5. The **Destination Folder** group box displays the amount of current disk space, the amount of disk space required for the Micromeritics software, and the folder into which the application will be installed.

If the default location is not acceptable, click **Browse** to choose the folder.

6. If you want to run the Micromeritics software from the desktop, select the checkbox just below the Destination Folder group box to add an icon to the desktop.
7. The Micromeritics software icon is added to the Micromeritics folder by default. If you prefer a different folder, enter or select one from the drop-down list.
8. The **Install this application for All Users** check box indicates whether users other than the installer will be able to access the application from the Windows Start menu.



If the box is checked, the application can be accessed from the Windows Start menu by all users who are logged onto Windows. If the box is not checked, the application can be accessed from the Windows Start menu only by the user who installed the application.

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

**Analyzer Configuration**

**mi micromeritics®**

**Step 1**  
Select the number of analyzers that will be attached to this PC.  
Select 0 in the case that you are moving an analyzer from another PC to this PC or are doing off-line data reduction on this PC.  
Analyzers:  0  1  2  3  4

**Step 2**  
For each unit, enter the necessary information below.  
The analyzer serial number is on the analyzer identification label, typically located near the power switch.  
Enter the communications port number only, for example, 1 for COM1

Unit #	Analyzer Serial #	Communications Port #
1	<input type="text"/>	<input type="text"/>

< Back      Next >      Cancel

- In the Step 1 group box, click the radio button for the number of analyzers to be attached to this computer.



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

- In the Step 2 group box, enter the serial number(s).
- If the computer connection to the analyzer is via a serial communications port, the Communication Port field is displayed. Enter the communications port(s) for the analyzer(s) you are attaching to this computer.

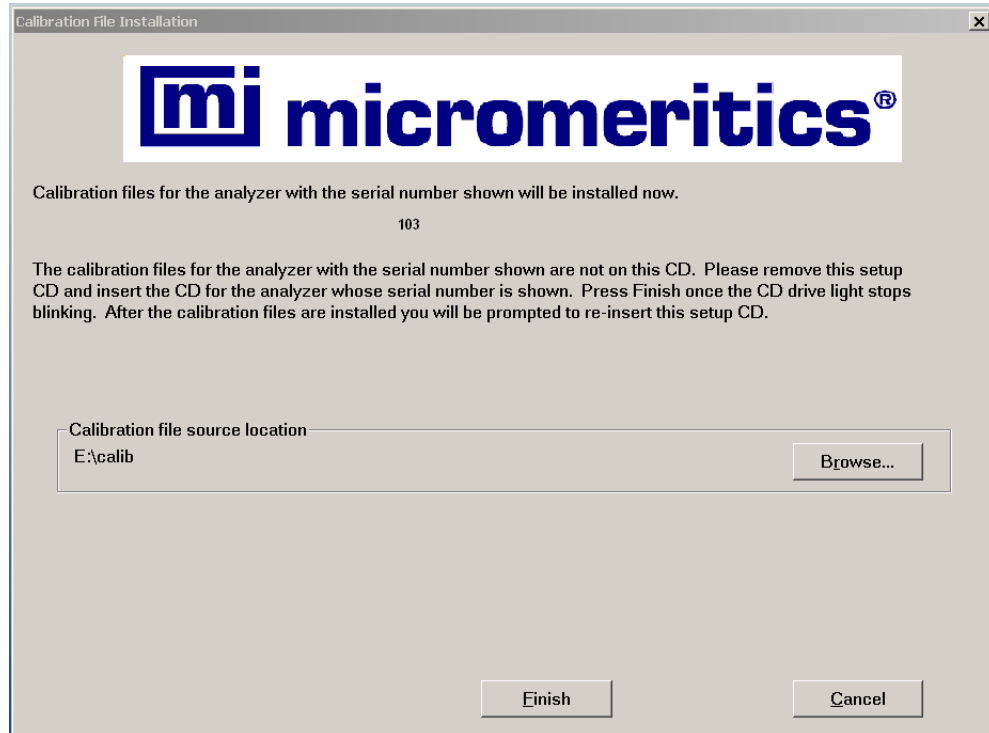
If the connection is by some other means, such as Ethernet, this field does not display.

- Click **Next**. The Calibration File Installation dialog is displayed.

- Choose one of the following:

- If you have only one analyzer attached to the computer, the source location will be the setup CD currently in the CD-ROM drive, which is the default location. Press **Finish** and proceed to step 16.
- If you have two analyzers attached to the computer, the application checks the current setup CD for the calibration files for the analyzer whose serial number you entered for Unit #1 in the previous dialog.

- a. If the files are found, the source location will be the setup CD currently in the CD-ROM drive, which is the default location. Press **Finish** and proceed to step 15.
- b. If the files are not found, the message shown below is added to the Calibration File Installation dialog.



- c. Remove the current setup CD and insert the CD containing the calibration files in the CD-ROM drive.
- d. When the CD drive light stops blinking, press **Finish**.
- e. The files are loaded, then this message is displayed:

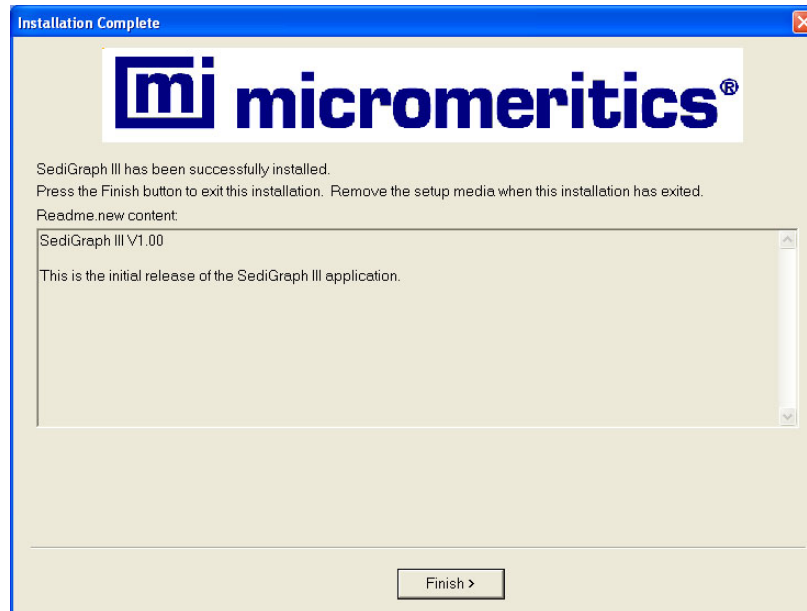
**Since the calibration files for analyzer (serial number) were on a separate CD please remove the calibration CD for (serial number) and insert the original setup CD.**

Remove the CD and insert the original setup CD in the CD-ROM drive, then press **OK**.

15. The Calibration File Installation dialog for the second analyzer is displayed.

Repeat steps 14 a or 14 b through 14 e, then proceed to step 16.

16. The Installation Complete dialog box is displayed..



17. Click **Finish** to close the dialog.

18. Remove the Setup CD and store in a safe place. The original Setup CD contains calibration files specific to your instrument. Upgrade CDs do not contain calibration files. Therefore, it is important that you maintain your original Setup CD in a secure location in the event calibration files need to be reinstalled.

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## Changing the Application Setup

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During instrument installation, the instrument's application software was installed and configured to meet your laboratory's requirements. If it becomes necessary to change your application configuration, for example, to add an analyzer or move an analyzer from one computer to another computer, you can use the application setup features on the 5120 Setup CD.

The application Setup CD contains these features:

- Upgrade software
- Add an analyzer
- Move an analyzer from one computer to another computer
- Remove an analyzer from the computer
- Change the analyzer setup
- Reinstall calibration files
- Uninstall the analysis program

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## Starting the Application Setup Program

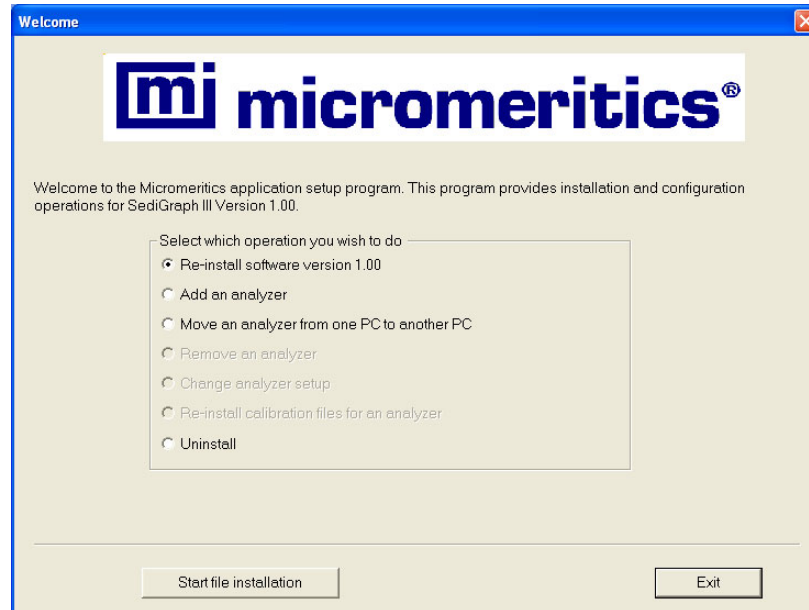
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To start the application setup program:

1. Ensure that the Micromeritics software is not operating.
2. Insert the program CD into your CD-ROM drive.
3. Select **Start** from the Status bar.
4. Select **Run** from the start menu.
5. 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**.

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



7. Select the operation you wish to perform. Procedures for performing each operation are in the following sections of this manual.
8. 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.
9. After you have completed all desired operations, click **Exit** to close the dialog.

## Installing New Software Versions

When you install a software upgrade, the system installs all of the application files and any status files that do not already exist on the computer. Existing analyzer status files are not affected and default and data files are not overwritten.

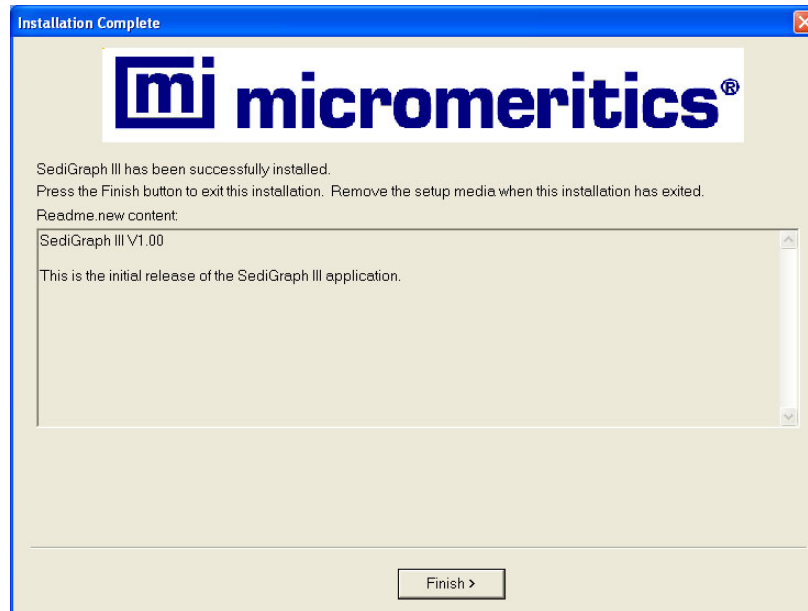
There are three types of subsequent installation; the software version controlled by the setup program is:

- 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. Turn off the analyzer (follow the steps in [“Turning Off the Analyzer ”](#) on page 2-8); the analyzer must be off when installing software upgrades.

2. Start the Setup program (refer to [“Starting the Application Setup Program” on page 4-8](#)). Choose the software option; remember, only the applicable option will display; 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 displays the Installation Complete dialog.



4. Click **Finish**; the application redisplay the setup Welcome dialog.
5. If no other operations are desired using this dialog, click **Exit** to close the dialog.
6. Turn on the analyzer (follow the steps in [“Turning On the Analyzer” on page 2-8](#)), then start the SediGraph application.

## Adding an Analyzer

Add an analyzer to the existing application as follows:

1. Start the Setup program (refer to [“Starting the Application Setup Program” on page 4-8](#)). Select **Add an analyzer**, then click **Next**; the Setup analyzer dialog is displayed.

Unit #	Analyzer Serial #	Communications Port #
2	<input type="text"/>	<input type="text" value="1"/>

2. Enter the serial number of the analyzer being added, then the port to which it is to be connected.
3. Click **Next**.
4. The setup Welcome dialog is redisplayed. If no other operations are desired using this dialog, click **Exit** to close the dialog.

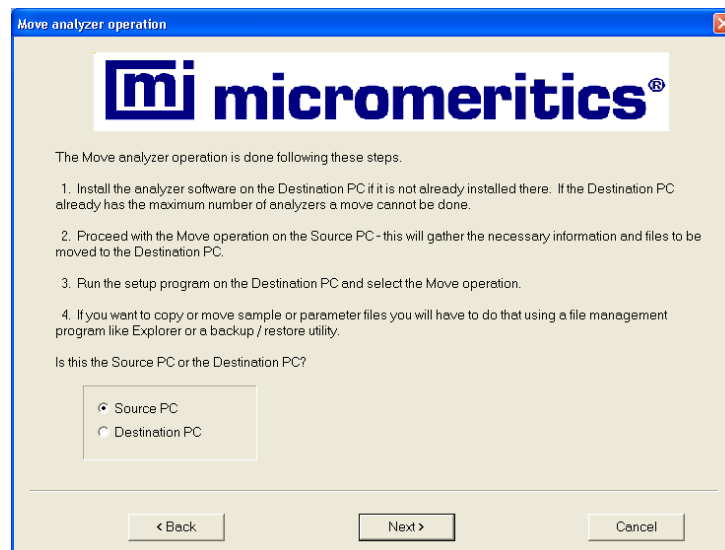
## Moving an Analyzer from one Computer to another Computer

You can move an analyzer from one computer (Source PC) to another computer (Destination PC).



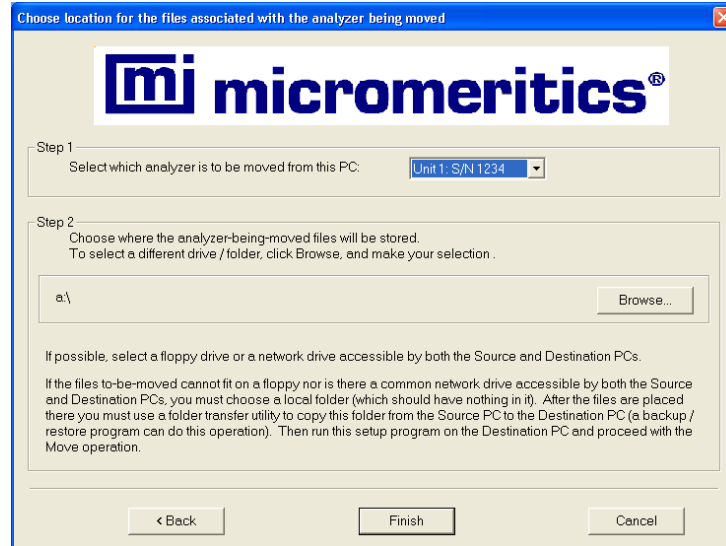
**This operation does not move sample or parameter files. To move these files, use a file management program such as Explorer.**

1. Choose one of the following:
  - Install the Micromeritics software on the destination computer if it is not already installed. Refer to [“Installing the 5120 Analysis Program” on page 4-4](#). Be sure to select 0 as the number of instruments; all related instrument information will be transferred in the Move operation.
  - If the Micromeritics software is already installed on the destination computer, proceed to Step 2.
2. Start the application setup program on the source computer. (Refer to [“Starting the Application Setup Program” on page 4-8](#)).
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.

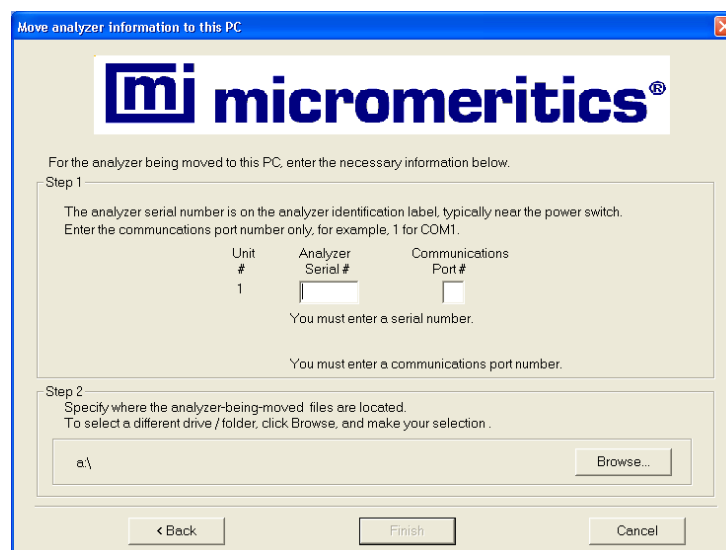




4. Select **Source PC**, then click **Next**; the following dialog is displayed.



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 disk drive 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 **Finish**; 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.

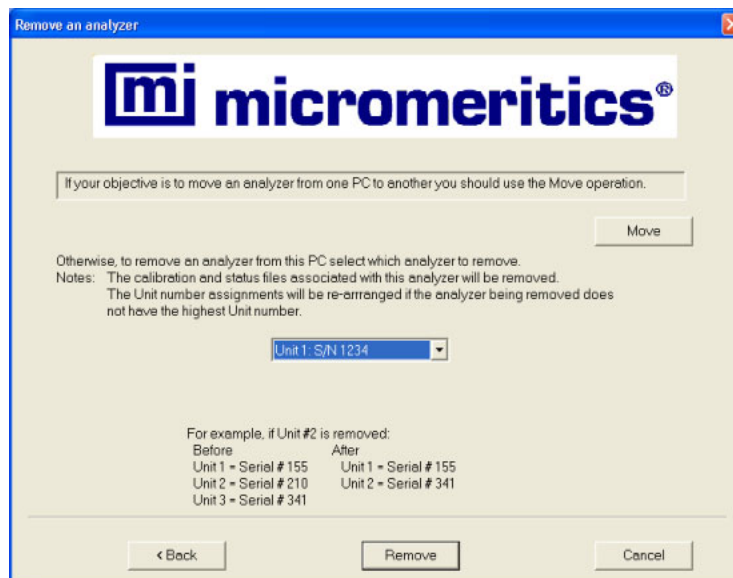


11. In the Step 1 group box, enter the serial number of the analyzer being moved and the communications port to which it will be attached.
12. In the Step 2 group box, click **Browse** and choose the location of the moved files.
13. Click **Finish**; the files are moved and the setup Welcome dialog is displayed.

## Removing an Analyzer

You can remove an analyzer from the computer as follows. When you remove an analyzer, the status files are removed as well.

1. Start the Setup program. Refer to [“Starting the Application Setup Program” on page 4-8](#).
2. From the Setup dialog, select **Remove an analyzer**, then click **Next**; the Remove an analyzer dialog is displayed.

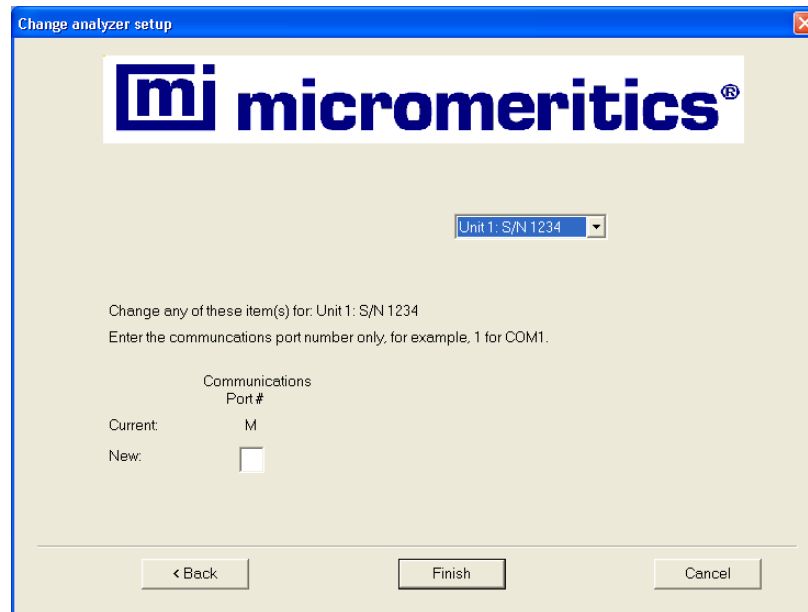


3. From the drop-down list, choose the serial number of the analyzer you want to remove.
4. Click **Remove**; the analyzer is removed and the Welcome screen is again displayed.
5. Click **Exit** to close the dialog.

## Changing an Analyzer Setup

Use this option to change the communications port to which the analyzer is attached.

1. Start the Setup program. Refer to “Starting the Application Setup Program” on page 4-8.
2. From the Setup dialog, select **Change analyzer setup**, then click **Next**; the Change analyzer setup dialog is displayed.

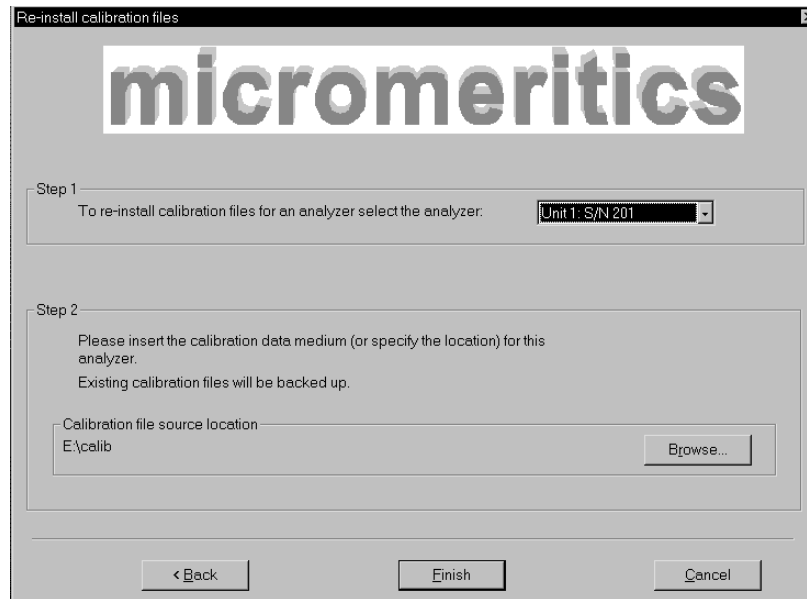


3. From the drop-down list, choose the analyzer you want to change.
4. Enter the new port number in the space provided.
5. Click **Finish**; the change is completed and the Welcome dialog is again displayed.
6. Click **Exit** to close the dialog.

## Reinstalling the Calibration Files

You can reinstall the files containing an analyzer's factory calibration data or updated calibration as follows.

1. Start the Setup program. Refer to “Starting the Application Setup Program” on page 4-8.
2. From the Setup dialog, select **Re-install calibration files for an analyzer**, then click **Next**; the Re-install calibration files dialog is displayed.

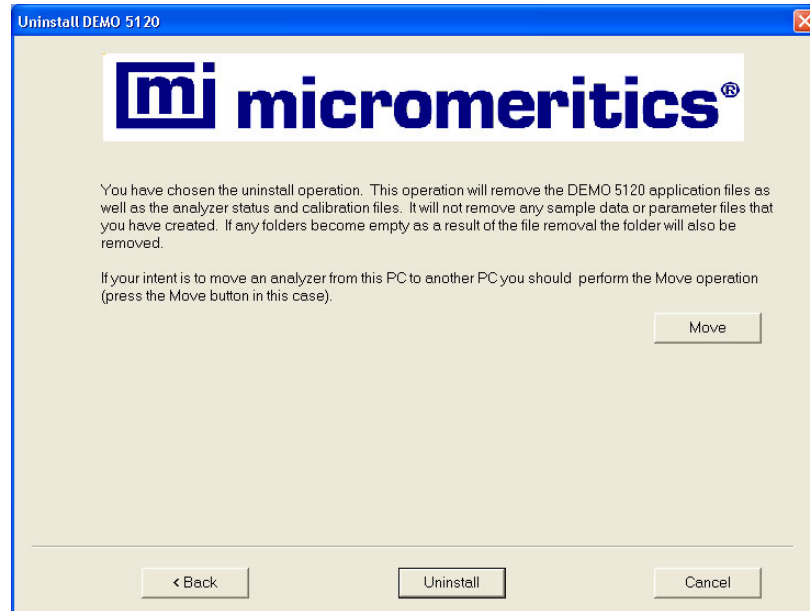


3. Select the analyzer whose calibration files you wish to reinstall from the drop-down list. If you have only one analyzer installed, a drop-down list is not included.
4. Choose one of the following:
  - To install the factory calibration data, insert the CD containing the calibration files; ensure that the CD drive is displayed as the calibration file source location. If not, click **Browse** and choose the CD drive.
  - If the instrument has been recalibrated since installation, click **Browse** and select the location of the updated calibration data file.
5. Click **Finish**; the calibration files are reinstalled and the Welcome dialog is again displayed.
6. Click **Exit** to close the dialog.

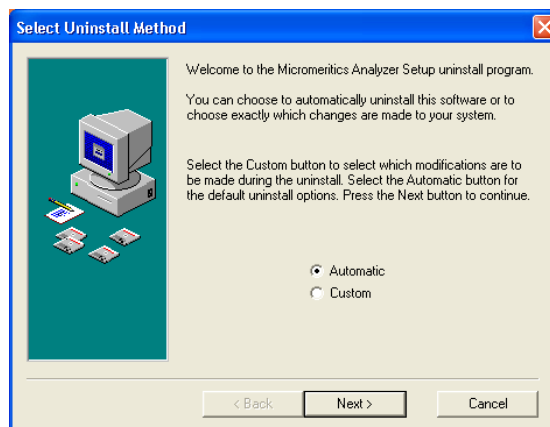
## Uninstalling the 5120 Analysis Program

When you uninstall the analysis program, the application removes the Micromeritics software, 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 “Starting the Application Setup Program” on page 4-8.
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 system uninstalls the Micromeritics software automatically and the setup Welcome dialog redisplay.
  - **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 redisplay.
5. Click **Exit** to close the Welcome dialog.

## 5 FILE MENU

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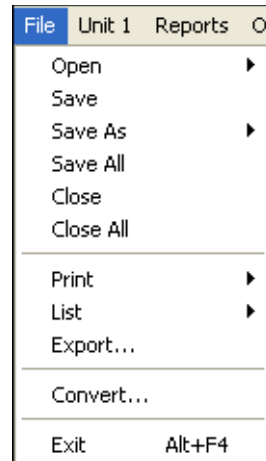


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## Description

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



Listed below are brief descriptions of the File menu options. Detailed descriptions follow this section.

<b>Open</b>	Opens an existing file or creates a new file. When you select this item, a drop-down menu is displayed containing four types of files: Sample information, Analysis conditions, Liquid properties, and Report options.
<b>Save</b>	Saves the file in the active window.
<b>Save As</b>	Allows you to save the file in the active window under a different name. It also can be used to save a subset of the file as a parameter file.
<b>Save All</b>	Saves all open files.
<b>Close</b>	Closes the file in the active window.
<b>Close All</b>	Closes all open files.
<b>Print</b>	Prints the entire contents of the selected file.

---

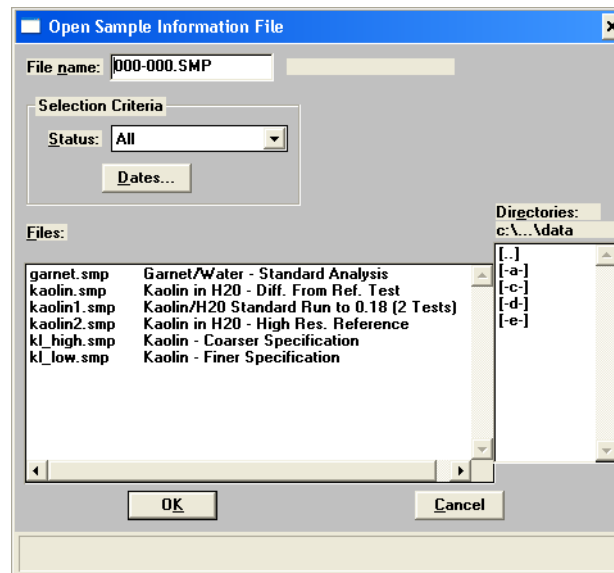
<b>List</b>	Generates a list of certain information for specified sample files or parameter files.
<b>Export</b>	Exports a sample file in ASCII format.
<b>Convert</b>	Converts a sample file created with a non-Windows version of the SediGraph analysis program to a file compatible with Windows.
<b>Exit</b>	Exits the analysis program.

## Open

Select **Open** to create a file or edit an existing one. The following file types are available:

- Sample information
- Analysis conditions
- Liquid properties
- Report options

Regardless of which file type you select, a dialog similar to the one shown below is displayed.



**File name:**

For *sample information files*, this field contains the next sequenced file name generated by the system.

For *parameter files*, the file name displayed includes the wild card (\*) and the default extension as follows :

\*.ANC for analysis conditions

\*.LIQ for liquid properties

\*.RPO for report options

If you are creating a new file, enter a name in the File name field. If you are editing an existing file, select a file from the list.

File names can contain up to 8 alphanumeric characters.

Refer to "Selecting Files" in Chapter 2 for a description of the other fields in this dialog.

---

## Sample Information

---

Sample information files contain information used to control the analysis, as well as collected or manually entered data. You must assign a sample information file to every analysis. You also can edit an existing sample information file. A sample information file consists of five parts:

- sample identification
- material properties
- analysis options
- report options
- collected/entered data

Sample information files are stored in directories (also called folders). For efficiency and organization purposes, it is recommended that no more than 400 files be stored in a single directory. A good way for organizing and storing files is to create a new directory for each month; for example, jan2003, feb2003, etc.

Parts of the sample file can also exist as *parameter* files separate from the sample information file itself. These parameter files contain frequently used analysis conditions which may be conveniently loaded into a new sample information file. They also may be edited as required.

Sample information files are presented in three different formats:

- **Advanced**

Presents all five parts of the sample information file in a single, tabbed dialog. Each tab opens its associated dialog. Use this format to set up standard defaults and to customize standard analysis conditions and report options files.

- **Basic**

Presents each part of the sample information file as a separate dialog. With this format, you can quickly create a sample information file using previously defined analysis conditions and report options.

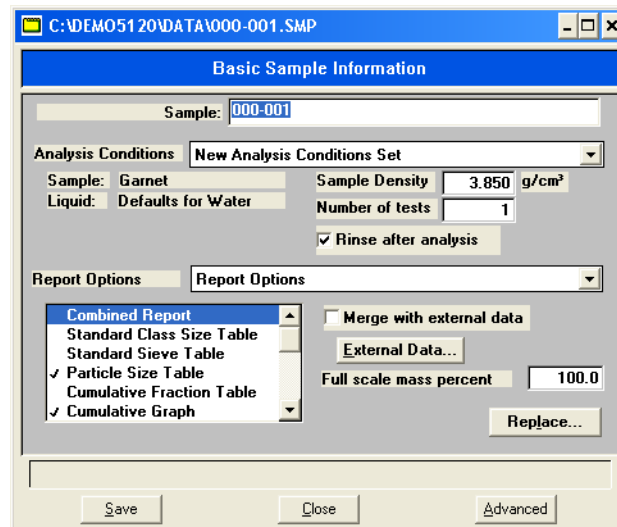
- **Restricted**

Displays in the same manner as the Basic format. However with this format, certain menu functions are disabled and you cannot switch to the Advanced format. This format also requires a password.

Select **Options > Option presentation** to choose the format you wish to use.

## Basic

When you open an existing sample information file or create a new one using the Basic format, all parts of that file are contained on a single dialog. With the Basic format, you can quickly create a sample information file using predefined parameter files. Chapter 3 provides step-by-step instructions for creating a Basic sample information file.



### Sample

Contains the next sequenced file description based on the format you specified in Sample defaults (refer to "Sample Defaults" in Chapter 8). You may enter a new description or add to the existing one if you wish.

*Range: 50 alphanumeric characters*

### Analysis Conditions

Displays a drop-down list containing previously defined analysis conditions files supplied with the analysis program, as well as any you may have created on your own.

This list is disabled for files which have been used for an analysis.

### Sample Liquid

Displays the type of sample and dispersing liquid used with the analysis conditions file you selected from the **Analysis Conditions** drop-down list.

**Sample Density**

Displays the density of the sample specified in the Analysis conditions file. You may edit these properties as long as the sample file is not complete (used in an analysis). If, however, significant adjustments are required, you should switch to advanced mode and define a new type of sample material.



**If the sample file is complete, density properties may be edited by selecting Advanced. Then select the Material Properties tab and Update Properties.**

**Number of tests**

Enter the number of analyses you wish to perform with this sample file; you may enter up to seven.

**Rinse after analysis**

Rinses the cell, the tubing, and the mixing chamber after each analysis. It is highly recommended that this option remain selected. If you deselect this option and rinses are not performed after analysis, inaccurate results may be obtained.

**Report Options**

Displays a drop-down list containing previously-defined report options files supplied with the analysis program, as well as any you may have created on your own.

**Reports List Box**

Displays the specified reports from the file you select from the Report Options drop-down list. You may change the report selection if you wish.

**Merge with external data**

Allows you to merge data collected using manual methods with the data collected for the current analysis.

**External Data...**

Enabled only if you selected **Merge with external data**. Allows you to enter the data you wish to have merged, the External Data dialog is displayed.

	Sieve Name	Aperture Diameter (µm)	Cumulative Finer Percent
1	No. 635	20	100.0
2	No. 270	53	100.0
3	No. 120	125	100.0
4	No. 50	300	100.0
5	No. 25	710	100.0
6	No. 12	1700	100.0
7	No. 5	4000	100.0
8	5/16 in.	8000	100.0
9	5/8 in.	16000	100.0
10	1 1/4 in.	31500	100.0

This type of table displays if you choose **Sieve size** for the size type.

**Insert**

Allows you to enter new data in the table. If this is a particle size table, you may enter the particle size and cumulative percent for the particle. If this is a sieve table, a set of sieves is displayed so that you may enter the percent passed through each size.

**Delete**

Removes the selected row from the table.

**Clear**

Deletes all but one entry of the table (one entry is required). So that it is not deleted in error, a warning message is displayed.

**Size Type**

Allows you to specify the type of size data.

**Distribution Type**

Allows you to specify the type of distribution data.

**Autoscale percent of total sample**

When this option is selected, the overlapping regions of the collected data and the merged data are used to rescale the collected data so that the regions match.

When this option is deselected, the percentages you enter for the merged data are used and the nonoverlapping portion of the collected data is scaled to be the percent passing through the smallest sieve.

**Full scale mass percent:**

Allows you to specify the weight percent of the sample actually analyzed by the SediGraph versus the percent that is manually analyzed. The data are scaled accordingly.

Use this option if you analyzed part of the sample by another method but you do not wish to merge those results with the reports for the current analysis. This field is disabled if *Merge with external data* is selected.



Allows you to copy values from an existing file into the one you are creating. A dialog is displayed so that you may choose the file containing the values you wish to copy. Choose the desired file, click **OK**; the values are copied into the new file automatically. You may then edit these values without changing the file you copied them from.



## Advanced

When you open an existing sample information file or create a new one using the Advanced format, all parts of the sample file are displayed in a tabbed dialog. The Advanced format allows you to customize sample files. Chapter 3 provides step-by-step instructions for creating an Advanced sample information file.

The prompts for the **Sample**, **Operator**, **Submitter**, and **User Parameter** fields may be customized by selecting **Options**, **Sample defaults**. Refer to "Sample Defaults" in Chapter 8 for instructions on customizing these prompts.

### Sample

Contains the next sequenced file description based on the format you specified in Sample defaults (refer to "Sample Defaults" in Chapter 8). You may enter a new description or add to the existing one.

*Range: 50 alphanumeric characters*

### Operator Submitter

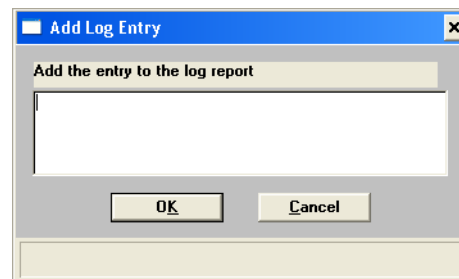
Displays the Operator and Submitter names if specified in Sample Information default file. Generally, these fields (if used) are completed when the sample file is created.

*Range: 40 characters*

<b>Type of Data</b>	Allows you to choose whether data are to be collected automatically or manually entered.
<b>User Parameters</b>	These fields are used specifically for SPC (Statistical Process Control) reporting. These user-specified parameters are defined in the Default Sample Information file. If SPC reporting is not desired, the fields can be omitted from the sample information dialog using the Omit checkbox in the default file. Refer to "Sample Defaults" in Chapter 8.
<b>Comments</b>	Enables you to enter comments in the sample information file.

**Add Log Entry**

Enables you to enter comments to be included in the instrument log. The Add Log Entry dialog is displayed.



Enter your comments, then click **OK**. Anything you enter in this dialog appears in the Instrument Log Report.

**Replace All...**

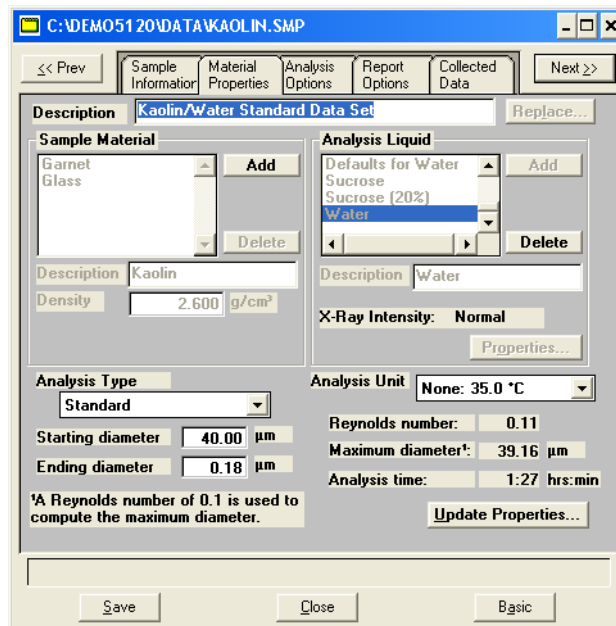
Allows you to copy values from an existing file into the one you are creating. A dialog is displayed so that you may choose the file containing the values you wish to copy. Choose the desired file, click **OK**; the values are copied into the new file automatically. You may then edit these values without changing the file you copied them from.

## Analysis Conditions

Analysis conditions files specify the data used to guide an analysis. They contain two parts of the sample file: Material properties and Analysis options. When you select to open an existing analysis conditions file or create a new one, a two-tabbed dialog is displayed.

### Material Properties

This dialog allows you to specify properties for the sample and analysis liquid.






#### Description

If you are opening an existing analysis conditions file, this field contains the description.

If you are creating an analysis conditions file, this field allows you to enter a name. You should use an intuitive name which characterizes the materials analyzed.

*Range: 40 alphanumeric characters*

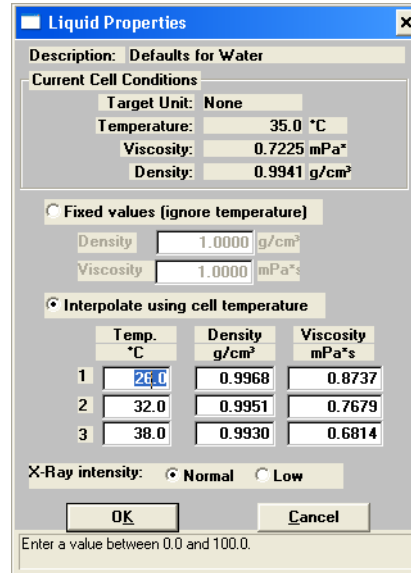
	<p>Allows you to copy values from an existing file to the one you have open. A dialog is displayed so that you may choose the file containing the values you wish to copy.</p> <p>Select the desired file, click <b>OK</b>; the values are copied automatically into the new file. You may then edit these values if you wish; the file you copied them from will not be affected.</p>
<b>Sample Material Group Box</b>	<p>Displays an alphabetical list of available sample materials. Once you select a sample material from this list, its description and density are displayed.</p>
<b>Description</b>	<p>Displays the sample material you select from the list. This field also is used to enter the name of sample materials you wish to add to the list.</p>
<b>Density</b>	<p>Displays the density of the sample material you selected from the list.</p>
	<p>Allows you to add sample materials to the list. In the <b>Description</b> field, enter the name of the material you wish to add, then click <b>Add</b>.</p> <p>This button also is used to change the density for a sample material. Select the sample material and enter the new density. Move the mouse pointer to another field; note that <b>Add</b> changes to <b>Change</b>. Click <b>Change</b>; the values are changed.</p>
	<p>Allows you to delete sample materials from the list. Select the sample material you wish to delete, then click <b>Delete</b>.</p>
<b>Analysis Liquid Group Box</b>	<p>Displays a list of the Liquid Properties files defined in the Default Parameters directory, as well as any you have created.</p>
<b>Description</b>	<p>Displays the analysis liquid you select from the list. This field also is used to enter the name of analysis liquids you wish to add to the list.</p>

## X-Ray Intensity

Displays the X-ray intensity selected for the analysis liquid. The intensity is selected in Liquid Properties dialog.

**Properties...**

Allows you to edit the properties of the analysis liquid you select from the list. The Liquid Properties dialog is displayed.



**Liquid Properties**

Description: Defaults for Water

Current Cell Conditions

Target Unit: None

Temperature: 35.0 °C

Viscosity: 0.7225 mPa\*s

Density: 0.9941 g/cm³

Fixed values (ignore temperature)

Density: 1.0000 g/cm³

Viscosity: 1.0000 mPa\*s

Interpolate using cell temperature

	Temp. °C	Density g/cm³	Viscosity mPa*s
1	20.0	0.9968	0.8737
2	32.0	0.9951	0.7679
3	38.0	0.9930	0.6814

X-Ray intensity:  Normal  Low

OK Cancel

Enter a value between 0.0 and 100.0.

### Description

Contains the name of the Liquid Properties file.

### Current Cell Conditions

Displays the cell conditions of the analysis unit. These conditions are based on the temperature of the cell and are used in computing the analysis statistics displayed on the Material Properties dialog.

### Liquid Properties Values

Allows you to choose between fixed values or interpolated values based on the cell temperature.

If you select *Fixed values*, you must enter a value in the **Viscosity** and **Density** fields. These values will be maintained regardless of the cell temperature.

If you select *Interpolate using cell temperature*, you must enter three sets of values in the **Temp.**, **Density**, and **Viscosity** fields. These values will be used to interpolate the density and viscosity at the current cell temperature.

The table requires that the entered values be properly ordered. Temperature in ascending order for example. Enter values from left-to-right and from top-to-bottom.

### X-Ray intensity

Enables you to select the X-Ray intensity:

The *Normal* selection is optimized for most applications when using high X-ray absorption liquids, such as water.

The *Low* selection decreases intensity when using low X-ray absorption liquids, such as hydrocarbons.

**Add**

Allows you to add analysis liquids to the list and change values for an analysis liquid.

To add analysis liquids: In the **Description** field, enter the name of the liquid you wish to add, then click **Add**.

To change values of an analysis liquid: Highlight the liquid, then click **Properties**. Enter the new values, then click **OK**. Note that **Add** changes to **Change**; click **Change**.

**Delete**

Deletes the selected liquid from the list.

### Analysis Type

Allows you to specify whether you wish your analysis to be a Standard, High Speed or High Resolution.

*Standard* provides good resolution and average analysis time. *High speed* allows a faster analysis, but a little lower resolution. *High resolution* provides high resolution at the smallest diameters, but takes a longer time.

**Starting diameter**  
**Ending diameter**

Allows you to specify the range of sizes you wish to be included in the analysis.

The starting diameter generally should be *larger* than the largest particle expected to be in the sample.

The ending diameter must be *less* than the smallest size particle you are interested in.

Each time you change the values in these fields, the analysis statistics are updated automatically. A note also is added to the report header indicating changes have been made since the first analysis was performed.

**Analysis Unit**

Displays a list of the attached units and their temperatures. The displayed temperature is used to compute analysis statistics.

**Reynolds number:**

The Reynolds number is calculated for the starting diameter using the sample's density and the liquid's density and viscosity. If this number is greater than 0.3, large particles falling through the liquid may create turbulence, affecting both their velocity and the velocity of neighboring smaller particles. This results in an incorrect particle size distribution.

**Maximum diameter:**

The maximum diameter is calculated to have a Reynolds number equivalent to the one you entered as a default (from the Options menu). If your sample has more than a couple percent mass of particles larger than this diameter, the sample should be analyzed in a liquid with a higher viscosity.

**Analysis time:**

Time is calculated based on the sample density, liquid density and viscosity, and ending diameter. The actual analysis time may vary slightly if the analysis compartment temperature is different when the analysis takes place.

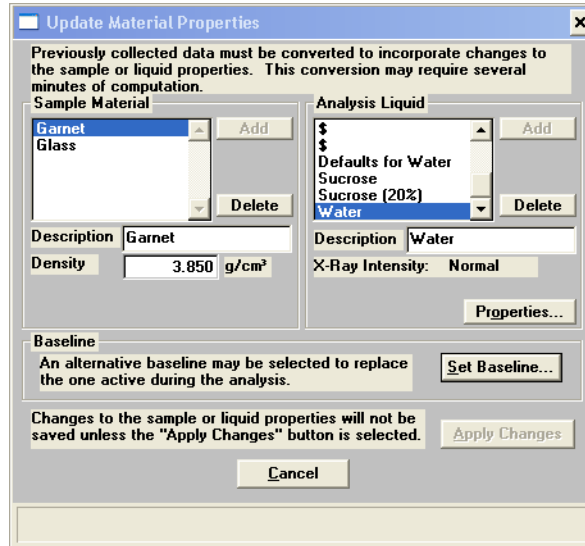
The Reynolds number, Maximum diameter, and Analysis time fields display analysis statistics. These values are updated automatically whenever a parameter affecting their computation is changed.

**Update Properties...**

Allows you to update the material properties of a *completed* analysis. This allows the collected data to be reprocessed based upon the new properties.

The material properties for the original analysis remain unchanged. A note is added to the report header describing the change.

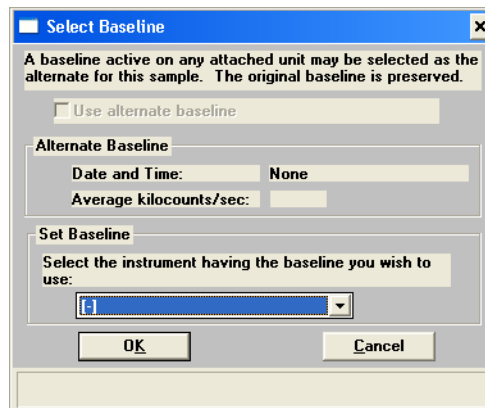
When you select this push button, the Update Material Properties dialog is displayed.



The contents of the **Sample Material** and **Analysis Liquid** group boxes are described in “[Material Properties](#)” on page 5-13.

**Set Baseline...**

Allows you to apply a baseline different than the one active in the original analysis; the Select Baseline dialog is displayed.





From the drop-down list, choose the instrument containing the baseline you wish to use. Then select *Use alternate baseline*. The original baseline is preserved if you decide to use it.

**Apply Changes**

Select this button to apply all changes to the material properties.

This message displays:

**All test data will be converted to the new data reduction options. Do you wish to continue?**

Click **Yes**.

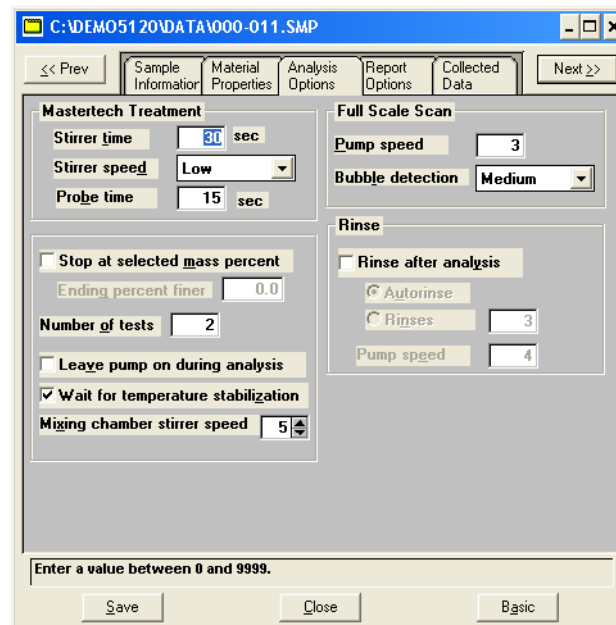
The data are converted and this message displays:  
**Application of new reduction options (file name) is complete.**

Click **OK** to close the message box.

## Analysis Options

This dialog allows you to edit analysis options as long as 1) an analysis is not in progress, and 2) the sample file does not contain manually entered data. Any changes you make to analysis parameters (after an analysis is complete) are noted in the report header.

Select the Analysis Options tab to display its dialog.



### MasterTech Treatment Group Box

Allows you to specify the stirrer time, stirrer speed, and probe time. (Available only if you have a MasterTech.)

Samples tend to settle in the beakers while waiting for sample analysis, especially if samples are prepared ahead of time, as in most cases when using a MasterTech. With the options in this group box, you can program the MasterTech stirrer and probe to redisperse the sample.

### Stirrer time

Allows you to enter the number of seconds to have the stirrer operate during resuspension.

### Stirrer speed

Allows you to choose stirrer speed. Coarse materials and less-stable dispersions may require more high-speed stirring than finer materials.

*Range: 1 to 10, with 1 being the slowest*

**Probe time**

Allows you to enter how long to have the ultrasonic probe operate during resuspension. Coarse materials and less-stable dispersions may require more high-speed stirring than finer materials.

**Other Options Group Box****Stop at selected mass percent**

Allows you to stop the analysis at a specified mass percent finer.

If you are unsure of the smallest size particle present in your sample, it may be difficult to determine an ending diameter which will include all desired data. With this option, you can choose to end mass percent at 0%, after having set the ending diameter at a small value of approximately 0.1  $\mu\text{m}$ . Using this method, you do not have to wait any longer than necessary for the end of the analysis.

**Ending percent finer**

Enabled only if you selected the previous option. Enter the point at which you wish the analysis to stop.

**Number of tests**

Allows you to enter the number of analyses you wish to be performed on the sample. You may enter up to 8.

**Leave pump on during analysis**

Coarse materials tend to settle in the tubing during analysis. This option allows you to have the pump operate during analysis, enabling easier rinsing and resuspension of the sample.

**Wait for temperature stabilization**

Select this option if you wish to have the temperature in the analysis compartment and mixing chamber stabilize to within  $\pm 0.5$  °C of the setpoint before the analysis begins.

**Mixing chamber stirrer speed**

Adjusts the speed of the magnetic stirring bar, which stirs the mixture in the mixing chamber. Select a number between 1 and 10. 1 represents the lowest speed and 10 the highest.

**Full Scale Scan Group Box    Pump speed**

Allows you to enter the speed at which you wish the cell pump to operate during the full-scale scan.

Use a pump speed of 2 or 3 if analyzing fine samples since they pump through the tubing easily. If coarse particles are being analyzed, especially if dispersed in higher viscosity liquids, a higher pump speed of 4 to 5 should be used.

If your SediGraph has the smaller 5-mm (3/16-in.) OD tubing, higher speeds may be required for finer particles also.

**Bubble detection**

This drop-down list allows you to choose the type of bubble detection you wish to use.

The presence of most bubbles in the cell can be detected during the full-scale scan that takes place at the start of the analysis. Detecting bubbles, however, is somewhat sample-dependent. Samples which contain very large particles may appear to have bubbles near the top of the cell, when actually the sudden change in X-ray intensity is due to incomplete filling of the topmost portion of the analysis cell. For samples of this type, you should use *coarse* bubble detection.

If only small particles are present in your sample (less than 1 mm), use *fine* bubble detection. For samples between these two ranges, use *medium* bubble detection.

**Rinse Group Box****Rinse after analysis**

Select this option if you wish to have the analysis cell rinsed after each analysis. Then select whether you wish to have the cell rinsed automatically or a specified number of rinses.

**Pump Speed**

Allows you to enter the speed at which you wish the cell pump to operate during the rinse operation.

## Liquid Properties

This dialog is used to:

- edit the properties of an analysis liquid
- specify properties for a new liquid properties file



The liquid properties also may be edited by selecting the Materials Properties dialog.

	Temp. °C	Density g/cm <sup>3</sup>	Viscosity mPa*s
1	25.0	1.1238	5.0410
2	30.0	1.1211	4.2470
3	35.0	1.1182	3.5400

### Description

If you are editing an existing file, this field contains the name of the file you selected.

If you are defining a new file, you must enter a name in this field.

**Liquid Properties Values**

Allows you to choose between fixed values or interpolated values for liquid properties.

If you select *Fixed values*, enter a value in the **Viscosity** and **Density** fields. These values are maintained regardless of the cell temperature.

If you select *Interpolate using cell temperature*, enter three sets of values in the **Temp.**, **Density** and **Viscosity** fields. These values are used to interpolate the density and viscosity at the current cell temperature.

The table requires that the entered values be properly ordered, Temperature in ascending order for example. Enter values from left-to-right and from top-to-bottom.

**X-Ray intensity**

Allows you to select the X-ray intensity.

The *Normal* selection is optimized for most applications when using high X-ray absorption liquids, such as water.

The *Low* selection decreases intensity when using low X-ray absorption liquids, such as hydrocarbons.

## Report Options

This dialog is used to:

- Edit report options
- Specify report options for a new file



### Report options ID

If you are editing an existing file, this field displays the identification of the report options file. You may change this name if you wish.

If this is a new file, enter a name of up to 50 characters.

**Replace...**

Allows you to copy values from an existing file to the one you have open. A dialog is displayed so that you may choose the file containing the values you wish to copy. Select the desired file, click **OK**; the values are copied automatically into the new file. You may then edit the new values without changing the original file.

### Show report title

Allows you include a title in reports.

To include a title, click the checkbox, then enter a title of up to 50 characters in the field next to it.

**Show graphic**

Enables you to select a graphic to appear in the report header. For example, you may wish to include your company logo.

To include a graphic, click the checkbox, then enter the pathname of the graphic file, or click **Browse** and select a file.

**Height:  
Width:**

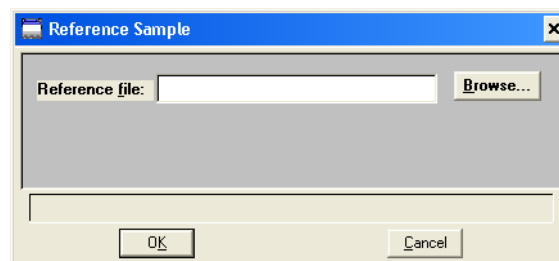
Enables you to enter the height and width of the graphic, in inches, if you selected **Show graphic**.

**Distribution Type**

Allows you to select the type of distribution data you wish to report.

**Reference...**

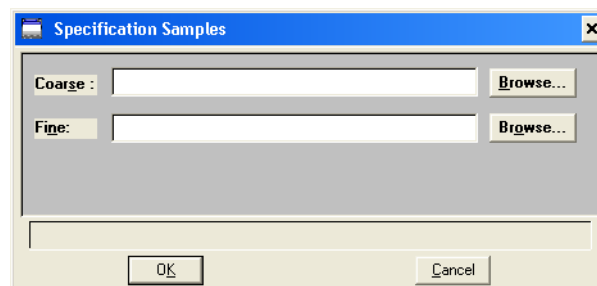
Allows you to specify a sample file with which to compare analysis results of the current sample; the Reference Sample dialog is displayed.



Click **Browse** to display the Reference Sample File Selection dialog containing a list of sample files from which to choose. Choose a file, click **OK**; the file name is copied into the Reference Sample dialog.

**Specification...**

Allows you to specify the sample files to be used for the coarse and fine specification boundaries. You then can quickly determine if the results of the current sample are within the specified boundaries. The Specification Samples dialog is displayed.

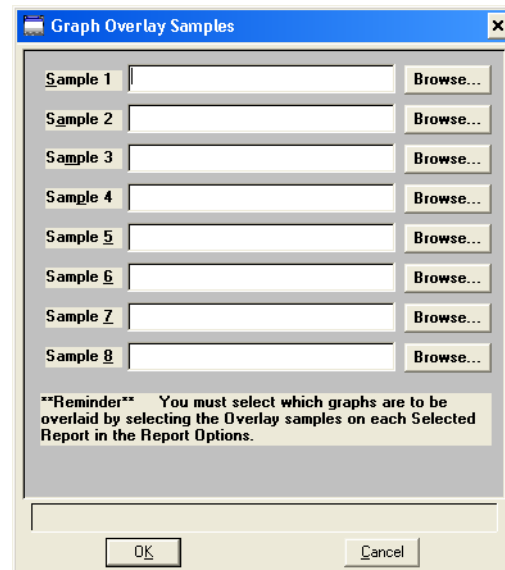




Select **Browse** to the right of each field to display the Specification Sample File dialog containing a list of sample files from which to choose. Choose a file, click **OK**; the file name is copied into the Specification Samples dialog.

**Overlays...**

Allows you to choose the sample files you wish to overlay onto selected plots; the Graph Overlay Samples dialog is displayed.



Click **Browse** to the right of each sample number field to display the Graph Overlay Sample File dialog containing a list of files from which to choose. You may select up to eight files. Refer "Generating Overlays" in Chapter 3 for instructions on generating overlays.

### Test

Use this drop-down list to specify the analysis you wish to have a report generated for.

### Reports to Generate

Contains a list of available reports.

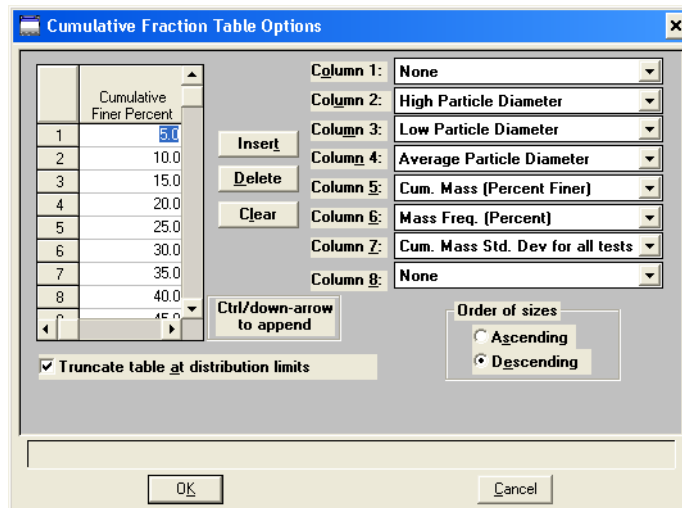
Using the mouse pointer or the arrow keys, move to the desired report and click the left mouse button, or press the **Spacebar**. When a report is selected, it is preceded with a check mark. You may deselect it in the same manner.



Allows you to edit the options of the reports in the **Reports to Generate** list box. Highlight the report you wish to edit and click **Edit**.

### **To Edit a Table**

If you wish to *edit a table*, a dialog similar to the one shown below is displayed.



### **Column [n]**

Allows you to specify the type of data you wish to display in that column. The choices, based on the table chosen, may include some or all of the following:

*None*

*High Particle Diameter*

*Low Particle Diameter*

*Average Particle Diameter*

*Cum. Mass (Percent Finer)*

*Mass Freq. (Percent)*

*Cum. Mass Std. Dev for all tests*

*Diff. from ref. (Percent Finer)*

*Out of spec (-%<, +%)*

*Surface Area Coarser*

*Area in Interval*

*Number Coarser*

*Number in Interval*

*Particle Size (Phi)*

*Settling Velocity*

### **Order of Sizes**

Allows you to choose between ascending or descending order for your data.

**Truncate table at distribution limits**

Allows you to shorten the table to the limits of the distribution.

**Data Points Table**

Allows you to enter the values at which you wish the data to be reported (or accept the defaults).

A rectangular button with a grey gradient and a black border, containing the word "Insert" in a bold, black, sans-serif font.

Allows you to insert points into the table. Highlight the point at which you wish to enter a new one, then click **Insert**. If no points are highlighted, the new point is inserted at the beginning.



**You may use Ctrl + Up to add points at the beginning and Ctrl + Down to add points at the end.**

A rectangular button with a grey gradient and a black border, containing the word "Delete" in a bold, black, sans-serif font.

Allows you to delete points in the table. Highlight the point you wish to delete, then click **Delete**.

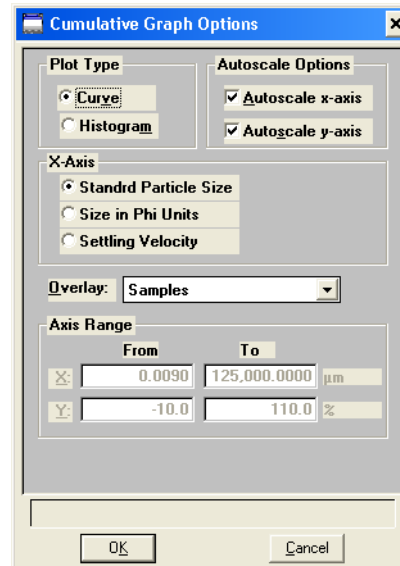
A rectangular button with a grey gradient and a black border, containing the word "Clear" in a bold, black, sans-serif font.

Allows you to delete all points in the table at one time.



## To Edit a Graph

If you wish to *edit a graph*, a dialog similar to the one shown below is displayed.



### Plot Type

Allows you to choose between curve or histogram for your plotted graphs.

### Autoscale Options

Select the options in this group box if you wish to have the X- and/or Y-axes automatically scaled. Both axes begin at zero, and the system uses the highest values collected during analysis as the ending points. The Axis Range fields are disabled if you choose to autoscale data.

If you choose not to autoscale data, you must enter the ranges for the X- and Y-axes.

### X-Axis

Allows you to select the how the X-axis values are to be displayed. Click the appropriate radio button to select one of the following:

*Standard Particle Size*

*Size in Phi Units*

*Settling Velocity*

**Overlay**

This drop-down list displays the type of overlays available.

Choose *Samples* if you wish to overlay the same type of curve from a different data reduction. Then click **Overlays** on the Report Options dialog to make your choice(s).

Choose *Tests* if you plan to overlay the same type of curve from all tests performed with this file.

**Axis Range**

This group box allows you to specify beginning and ending values for the X- and Y-axis ranges. Data collected outside these ranges are not included in the plot.

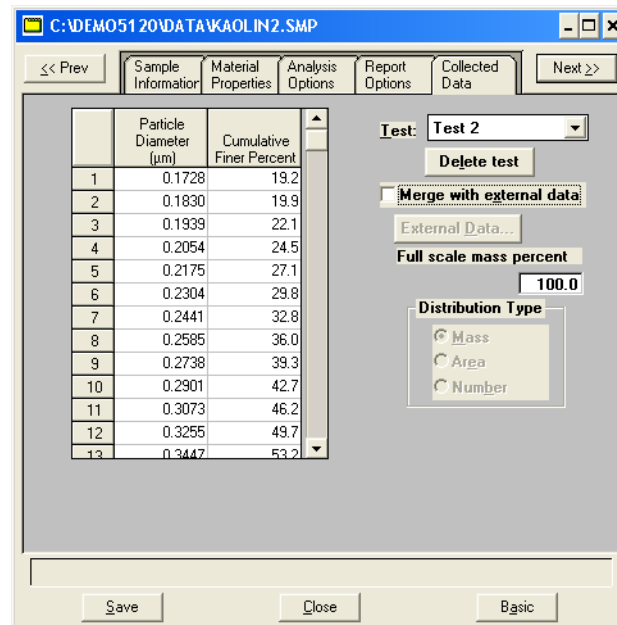


**The values entered in the *To* fields must be greater than the values entered in the *From* fields.**

## Collected/Entered Data

This dialog displays only when your option presentation is selected as **Advanced**. Depending on the type of data selected on the Sample Information screen, this dialog displays as either Collected Data or Entered Data.

### Collected Data



**Table** Displays the data collected for the current test.

**Test** Displays the current test for this sample file. If you wish to view data for another test, click on the down arrow to select the desired test.

**Merge with external data** Select this option to merge data collected by manual methods with the collected data.

**External Data...**

Enabled when you select **Merge with external data**. Displays the External Data dialog so that you can enter the data you wish to have merged.

	Sieve Name	Aperture Diameter (µm)	Cumulative Finer Percent
1	No. 635	20	100.0
2	No. 270	53	100.0
3	No. 120	125	100.0
4	No. 50	300	100.0
5	No. 25	710	100.0
6	No. 12	1700	100.0
7	No. 5	4000	100.0
8	5/16 in.	8000	100.0
9	5/8 in.	16000	100.0
10	1 1/4 in.	31500	100.0

This type of table displays if you choose **Sieve size** for the size type.

**Insert**

Allows you to enter new data in the table. If this is a particle size table, you may enter the particle size and cumulative percent for the particle. If this is a sieve table, a set of sieves is displayed so that you may enter the percent passed through each size.

**Delete**

Removes the selected row from the table.

**Clear**

Deletes all but one entry of the table (one entry is required). So that it is not deleted in error, a warning message is displayed.

**Size Type**

Allows you to specify the type of size data.

Select *Particle size* to enter the particle diameter and cumulative percent for the sample.

Select *Sieve size* to enter the percent passed through each sieve.

**Distribution Type**

Allows you to specify the type of distribution data.

**Autoscale percent of total sample**

When this option is selected, the overlapping regions of the collected data and the merged data are used to rescale the collected data so that the regions match.

When this option is deselected, the percentages you enter for the merged data are used and the nonoverlapping portion of the collected data is scaled to be the percent passing through the smallest sieve.

**Full scale mass percent:**

Allows you to specify the weight percent of the sample actually analyzed by the SediGraph versus the percent that is manually analyzed. The data are scaled accordingly.

Use this option if you analyzed part of the sample by another method but you do not wish to merge those results with the reports for the current analysis.

This field is disabled if *Merge with external data* is selected.

**Distribution Type**

These options are disabled on this dialog. The distribution type can be selected from the Report Options dialog.



## Entered Data



You cannot enter data if the analysis program is being used for offline data manipulation on a computer other than the one controlling the analyzer.

	Sieve Name	Aperture Diameter (µm)	Cumulative Finer Percent
1	No. 635	20	100.0
2	No. 270	53	100.0
3	No. 120	125	100.0
4	No. 50	300	100.0
5	No. 25	710	100.0
6	No. 12	1700	100.0
7	No. 5	4000	100.0
8	5/16 in.	8000	100.0
9	5/8 in.	16000	100.0
10	1 1/4 in.	31500	100.0

This type of table displays if you choose **Sieve size** for the size type.

### Table



Allows you to enter pertinent data.

Allows you to enter new data in the table. If this is a particle size table, you may enter the particle size and cumulative percent for the particle. If this is a sieve table, a set of sieves is displayed so that you may enter the percent passed through each size.



Removes the selected row from the table.



Deletes all but one entry of the table (one entry is required). So that it is not deleted in error, a warning message is displayed.

### Size Type

Allows you to specify the type of size data.

Select *Particle size* to enter the particle diameter and cumulative percent for the sample.

Select *Sieve size* to enter the percent passed through each sieve.

### Distribution Type

Allows you to specify the type of distribution data.

## Save

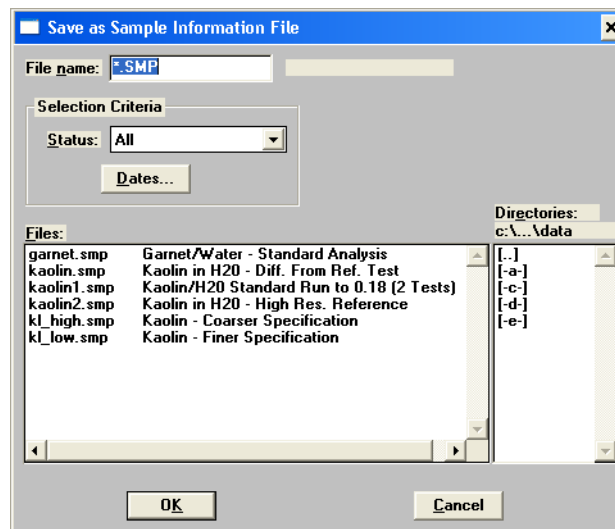
**Save** enables you to save any changes you have made to the file in the active window. The file is saved under its current name.

## Save As

**Save As** enables you to save the sample file or parameter file in the active window under a new name. Saving the file under a new name allows you to make modifications without changing the original file.

You may save a sample information file as another sample information file or as any parameter file. Parameter files, however, may be saved only as another parameter file of the same type. For example, you may save a sample information file as an analysis conditions file, liquid properties file, or a report options file. But an analysis conditions file may be saved only as another analysis conditions file.

When you select **Save As** with a sample information file open, four choices are presented: Sample information, Analysis conditions, Liquid properties, and Report options. Select the desired file type, a dialog similar to the one shown below is displayed.



### File name:

Choose one of the following options:

- Enter a name of up to 8 alphanumeric characters.
- Select a file from the **Files:** list box. If you select an existing file as the new name, the data contained in that file are overwritten.



This push button and the contents of these list boxes are explained in **Selecting Files** in Chapter 2.

**Files:**

**Directories:**

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## Save All

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**Save All** enables you to save 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.

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## Close

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**Close** enables you to close the file in the active window. The following message is displayed if changes have been made to the file:

**(File name) has been changed.  
Save changes before closing?**

- **Yes** saves any changes and closes the active window
- **No** discards any changes and closes the active window
- **Cancel** leaves the file active

---

## Close All

---

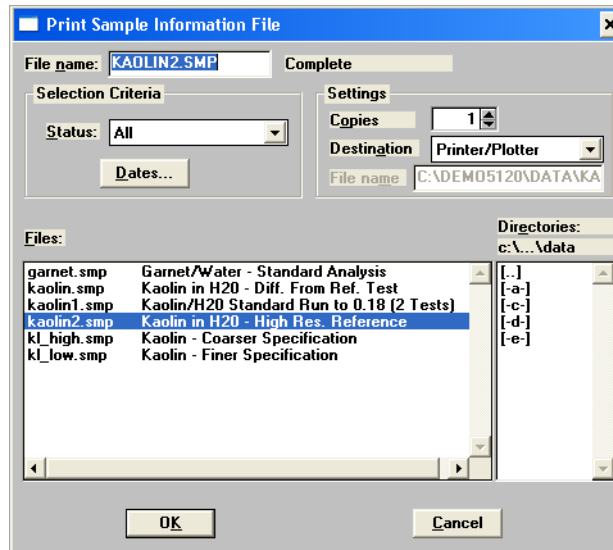
**Close All** enables you to close *all* open files under their current names. The following message is displayed for each file in which changes have been made:

**(File name) has been changed.  
Save changes before closing?**

- **Yes** saves any changes and closes the active window
- **No** discards any changes and closes the active window
- **Cancel** leaves the file active

## Print

**Print** enables you to print the entire contents of a file. When you select **File > Print** from the main menu, four choices are presented: Sample information, Analysis conditions, Liquid properties, and Report options. Regardless of which file type you select, a dialog similar to the one shown below is displayed.



**File name:**

The name of the file you select from the **Files:** list box is copied to this field.



This push button and the contents of these list boxes are explained in **Selecting Files** in Chapter 2.

**Files:**

**Directories:**

**Destination:**

Contains a drop-down list of the available print destinations.

If you select *Screen*, the file is displayed on the screen.

If you select *Printer* or *Printer/Plotter*, select the number of copies to be printed. The requested file is sent to your default printer.

If you select *File*, the tabular reports of the requested file are converted to a text file which can be viewed with a text editor or other text file manipulation tools. You also must enter a name in the **File name:** field of the Settings group box.

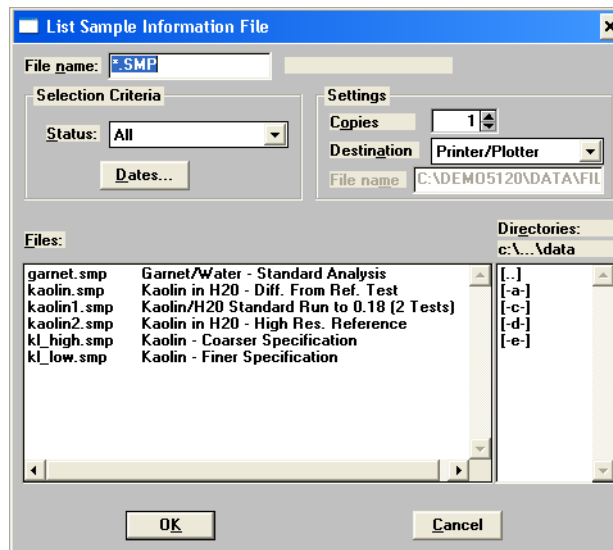
## List

**List** enables you to generate a listing of the following information on a selected file:

- file name
- date the file was created
- time the file was created
- file identification
- file status

When you select **File, List** from the main menu, four choices are presented: Sample information, Analysis conditions, Liquid properties, and Report options.

Regardless of which file type you select, a dialog similar to the one shown below is displayed.



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



You may request a list of multiple files by holding down **Ctrl** while selecting files. If no files are selected, a list is generated for *all* files.



This push button and the contents of these list boxes are explained in **Selecting Files** in Chapter 2.

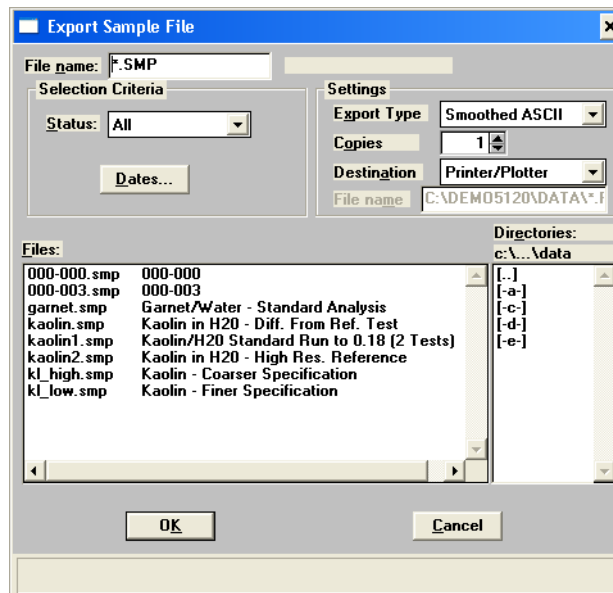
**Files:**  
**Directories:**

- Destination:** Contains a drop-down list of the available print destinations.
- Choices: Screen, Printer, Printer/Plotter, File*
- If you select *Printer* or *Printer/Plotter*, enter the number of copies to be printed.
- Settings, File name:** Enabled only if you select *File* as the destination. Enter a name in the **File name:** field.

## Export

**Export** allows you to copy data in a sample information file and reformat it in ASCII format as either smoothed or unsmoothed data. The ASCII data then can be imported into other applications, such as spreadsheets, accepting ASCII format. You may select multiple files by holding down and clicking the left mouse button once on each file.

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



- File name:** The name of the file you select from the **Files:** list box is copied to this field.

**Dates...**

This push button and the contents of these list boxes are explained in **Selecting Files** in Chapter 2.

**Files:**

**Directories:**

**Settings Group Box  
Export Type**

Drop-down list containing the types of data export available.

Choices: *Raw ASCII*, *Smoothed ASCII*, *Unsmoothed ASCII*

*Raw ASCII* is time, height, and mass fraction.  
*Smoothed ASCII* exports data in a form as used in reports.  
*Unsmoothed ASCII* exports data in a form as collected by the instrument. Refer to **Appendix J** for a description of the smoothing technique.

**Destination:**

Contains a drop-down list of the available destinations.

Choices: *Screen*, *Printer*, *Printer/Plotter*, *File*

If you select *Printer* or *Printer/Plotter*, enter the number of copies to be printed.

**Settings, File name:**

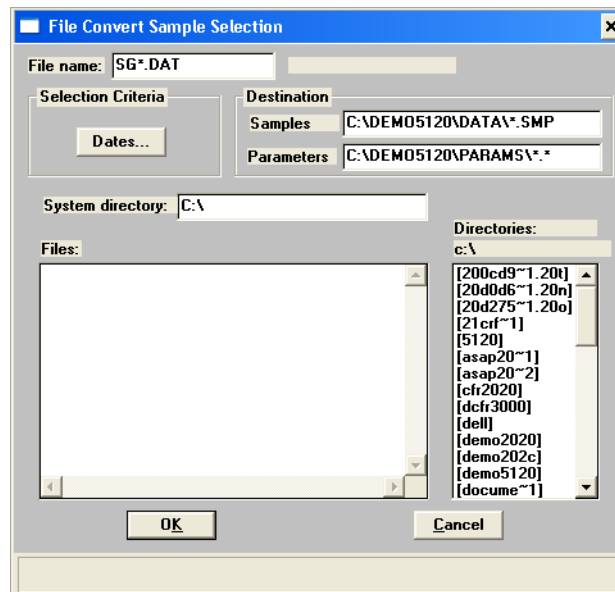
Enabled only if you select *File* as the destination. Enter a name in the **File name:** field.

## Convert

Use this option to convert sample information files created with a non-Windows version of the SediGraph analysis program to sample information files that are compatible with Windows. You may select multiple files by holding down **Ctrl** and clicking the left mouse button once on each file.

After a sample file has been converted to the Windows version, it and its parameter files can be used with any analysis as long as the analysis has not been completed. You cannot, however, update material properties.

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



### File name:

Use this field to limit the list of file names displayed in the **Files:** list box. For example, in the dialog shown above, file names have been limited to those beginning with **SG** by entering **SG\*.DAT** in the **File name:** field.



Refer to "Selecting Files" in Chapter 2 for instructions on using this push button.



**Destination,  
Samples:**

Defaults to the appropriate directory in the WIN5120 directory. You may change this destination if you wish.

**Destination,  
Parameters:**

Defaults to the appropriate directory in the WIN5120 directory. You may change this destination if you wish.

**System directory:**

Enter the directory containing the parameter files.

Two types of parameter files are associated with a non-Windows sample file; Liquid Properties (**lp**<table number>.**dat**) and User-Defined Report Table (**ud**<table number>.**dat**). These files are *required* for a successful conversion.

If you are converting files using the same computer on which the files were created, all required files will be located automatically during conversion.

If you plan to use a different computer for converting files, it is imperative that the required files for each sample file be copied to complete the conversion. It is best to zip the entire directory from the source computer and then unzip on the destination computer, especially if you have numerous files to convert. This way, you are ensured that all required files accompany the sample file.

If you fail to enter a directory in this field, the conversion proceeds, but is incomplete since all files may not be located. A warning message is displayed in the **Status** window if all parameter files are not found.

---

## Exit

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Exit enables you to exit the SediGraph analysis program. Select **File > Exit** from the main menu. Even if an analysis is in progress, it will continue until completion; analysis data are collected and stored in the analyzer.

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

**(file name) has been changed. Save changes before closing?**

- **Yes** saves any changes and exits the analysis program
  - **No** abandons any changes and exits the analysis program
  - **Cancel** leaves the analysis program active
- If an analysis is in progress, the following message is displayed:

**You tried to exit the WIN5120 analysis program while an analysis is in progress. While this is possible, the data collected while the WIN5120 analysis program is inactive will not be permanently recorded until the analysis program is re-started. A power failure to the instrument could cause some data to be lost.**

- **Yes** exits the analysis program
- **No** leaves the analysis program active and allows the analysis to finish

**If the MasterTech is being used, the current analysis continues until it is finished; subsequent analyses are postponed and resumed when the analysis program is restarted.**



**Although data are stored in the analyzer when you exit the program, data are not saved to disk in the computer until you reenter the program. If a power failure occurs and the analyzer does not have an Uninterruptible Power Supply (UPS), any data not saved are lost.**

- If a report is being printed, the following message is displayed:

**CAUTION: A report is currently printing. If you exit the program the report will be canceled. Do you want to cancel the report and exit the program?**

- **Yes** cancels the report and exits the analysis program
- **No** leaves the analysis program active and allows the reports to finish

## 6 UNIT MENU

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## Overview

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The Unit menu contains the operations which can be performed with the SediGraph 5120. The main menu contains a Unit menu for each attached analyzer. For example, if you have two attached analyzers, the main menu contains two Unit menus.

For easy differentiation, the status displays associated with each individual unit are displayed in different colors. The unit number and the serial number also are displayed in the title bar of the operational windows.

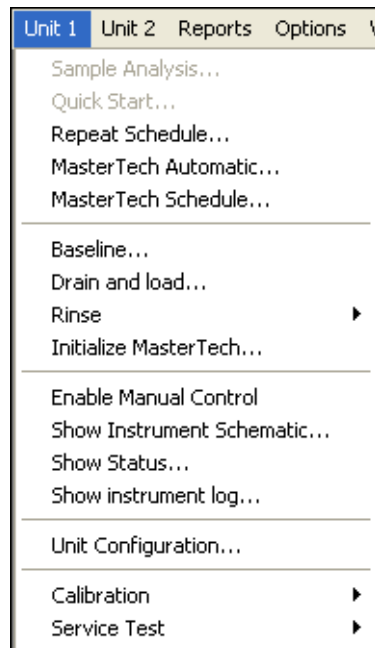


**The Unit menu does not appear on the menu bar if the analysis program is being used for offline data manipulation.**

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## Description

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Listed below are brief descriptions of the Unit menu options. Detailed descriptions are found

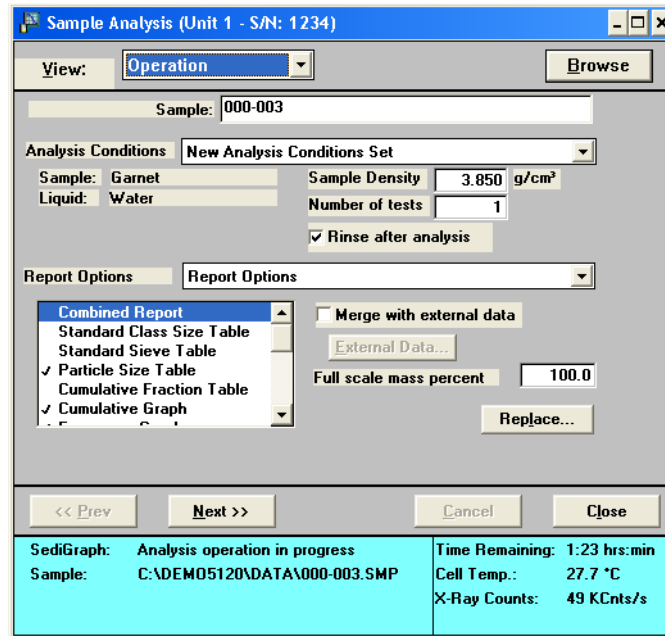
later in this chapter.

<b>Sample Analysis</b>	Use this mode of operation to perform single sample analyses. This option is disabled if analyses are being performed in another mode.
<b>Quick Start</b>	Use this mode of operation to perform successive sample analyses.
<b>Repeat Analysis</b>	Use this mode of operation to perform multiple analyses on the same sample.
<b>MasterTech Automatic</b>	Use this mode of operation to analyze a series of samples of the same type with the same analysis conditions. Sample files are created automatically. Enabled only if a MasterTech is installed.
<b>MasterTech Schedule</b>	Use this mode of operation to analyze a series of samples which may be different in size and shape and, consequently, require different analysis conditions. Enabled only if a MasterTech is installed.
<b>Baseline</b>	Allows you to perform a baseline measurement.
<b>Drain and Load</b>	Allows you to perform a drain and load operation
<b>Rinse</b>	<p>Allows you to perform a rinse operation.</p> <p>Choose <i>SediGraph</i> to rinse the analysis cell, the mixing chamber, and the tubing of the SediGraph.</p> <p>Choose <i>MasterTech</i> to rinse the MasterTech tubing into a specified beaker.</p> <p>Choose <i>Both</i> to rinse the analysis cell, the mixing chamber, and the tubing for both the SediGraph and MasterTech.</p>
<b>Initialize MasterTech</b>	Allows you to start the MasterTech or realign the MasterTech turntable if it has been disturbed.
<b>Enable Manual Control</b>	Allows you to control the system manually when the analyzer is idle.
<b>Show Instrument Schematic</b>	Displays a schematic of the analyzer.

<b>Show Status</b>	Displays the status window of the operation in progress.
<b>Unit Configuration</b>	Displays the configuration of the analyzer.
<b>Calibration</b>	Enables you to enter calibration data. This option is enabled only with the direction of a Micromeritics service representative.
<b>Service Test</b>	Enables you to perform certain troubleshooting procedures. This option is enabled only with the direction of a Micromeritics service representative.

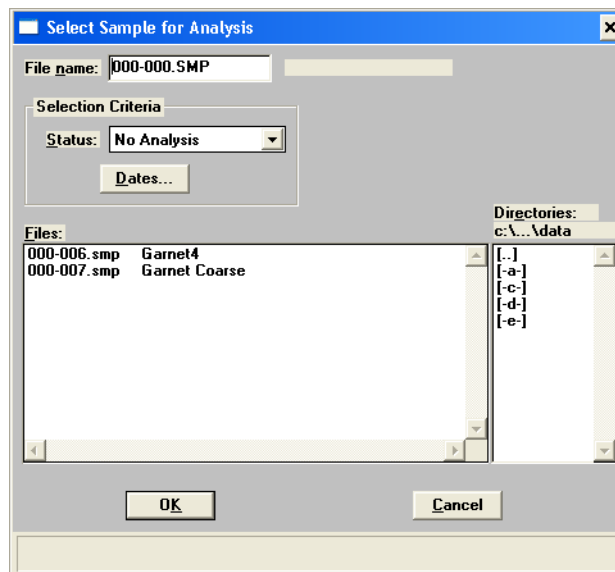
# Sample Analysis

Use this mode of operation to perform individual sample analyses. When you select this option from the Unit menu, the Sample Analysis dialog box is displayed.




**Browse...**

Displays the Select Sample Information dialog box, allowing you to select a sample file for your analysis.



Select the sample, then click **OK**.



<b>Sample</b>	Displays the sample identification string of the sample.
<b>Analysis Conditions</b>	<p>Displays the analysis conditions file in the selected sample information file.</p> <p>The drop-down list enables you to select another analysis conditions file if desired.</p> <p>This list is disabled for files which have been used for an analysis.</p>
<b>Sample: Liquid:</b>	Displays the type of sample and dispersing liquid used with the analysis conditions file you selected from the Analysis Conditions drop-down list.
<b>Sample Density</b>	Displays the density of the sample specified in the Analysis conditions file. You may edit these properties as long as the sample file is not complete (used in an analysis). If, however, significant adjustments are required, you should switch to advanced mode and define a new type of sample material.
 <b>If the sample file is complete, density properties may be edited by opening the sample file and selecting Advanced, then selecting the Material Properties tab and Update Properties.</b>	
<b>Number of tests</b>	Allows you to enter the number of analyses you wish to perform using this sample file; you may enter up to eight.
<b>Rinse after analysis</b>	Allows you to rinse the cell, the tubing, and the mixing chamber after each analysis. It is highly recommended that this option remain selected. If you deselect this option and rinses are not performed after analysis, inaccurate results may be obtained.
<b>Report Options</b>	<p>Displays the report options file in the selected sample information file.</p> <p>The drop-down list enables you to select another report options file if desired.</p>
<b>Reports List Box</b>	Displays the selected reports from the file you select from the Report Options drop-down list. You may change the report selection if you wish.

**Merge with external data**

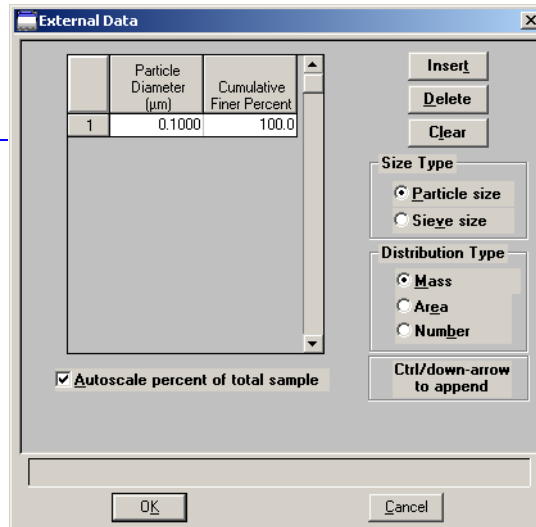
Allows you to merge data collected using manual methods with the data collected for the current analysis.

**External Data...**

Enabled when you select **Merge with external data**. Displays the External Data dialog so that you can enter the data you wish to have merged.

	Sieve Name	Aperture Diameter (µm)	Cumulative Finer Percent
1	No. 635	20	100.0
2	No. 270	53	100.0
3	No. 120	125	100.0
4	No. 50	300	100.0
5	No. 25	710	100.0
6	No. 12	1700	100.0
7	No. 5	4000	100.0
8	5/16 in.	8000	100.0
9	5/8 in.	16000	100.0
10	1 1/4 in.	31500	100.0

This type of table displays if you choose **Sieve size** for the size type.



**Insert**

Allows you to enter new data in the table. If this is a particle size table, you may enter the particle size and cumulative percent for the particle. If this is a sieve table, a set of sieves is displayed so that you may enter the percent passed through each size.

**Delete**

Removes the selected row from the table.

**Clear**

Deletes all but one entry of the table (one entry is required). So that it is not deleted in error, a warning message is displayed.

**Size Type**

Allows you to specify the type of size data.

Select *Particle size* to enter the particle diameter and cumulative percent for the sample.

Select *Sieve size* to enter the percent passed through each sieve.

**Distribution Type**

Allows you to specify the type of distribution data.

**Autoscale percent of total sample**

When this option is selected, the overlapping regions of the collected data and the merged data are used to rescale the collected data so that the regions match.

When this option is deselected, the percentages you enter for the merged data are used and the nonoverlapping portion of the collected data is scaled to be the percent passing through the smallest sieve.

**Full scale mass percent:**

Allows you to specify the weight percent of the sample actually analyzed by the SediGraph versus the percent that is manually analyzed. The data are scaled accordingly.

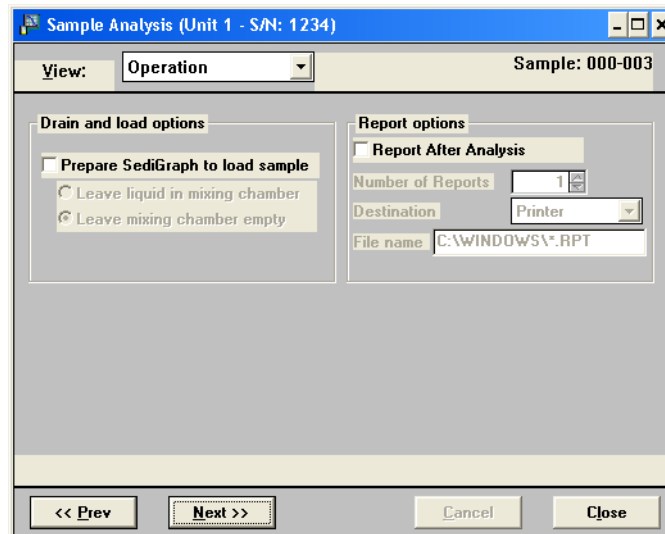
Use this option if you analyzed part of the sample by another method but you do not wish to merge those results with the reports for the current analysis.

This field is disabled if *Merge with external data* is selected.

A rectangular button with a black border and the text "Replace..." in a bold, sans-serif font.

Allows you to copy values from an existing file into the one you are creating. A dialog box is displayed so that you may choose the file containing the values you wish to copy. Choose the desired file, click **OK**; the values are copied into the new file automatically. You may then edit these values without changing the file you copied them from.

When you select **Next>>** on this window, all selections are saved; then the following view of the Sample Analysis dialog box is displayed.



## View

Allows you to choose which view you wish displayed in the window from a drop-down list.

*Choices: Operation, Analysis Log, Instrument Schematic*

*Operation* displays the data points as they are collected during analysis.

*Analysis Log* displays a list of recent operations and error messages for the active analyzer. By default, sample analyses and error messages are logged for seven days and baselines are logged for 30 days. You may receive a printout of the analysis log by clicking **Report**.

*Instrument Schematic* displays a schematic of the instrument.

## Prepare SediGraph to load sample

Select this option if the sample has not been loaded into the mixing chamber. If you select this option, a drain and load operation is performed.

## Leave liquid in mixing chamber Leave mixing chamber empty

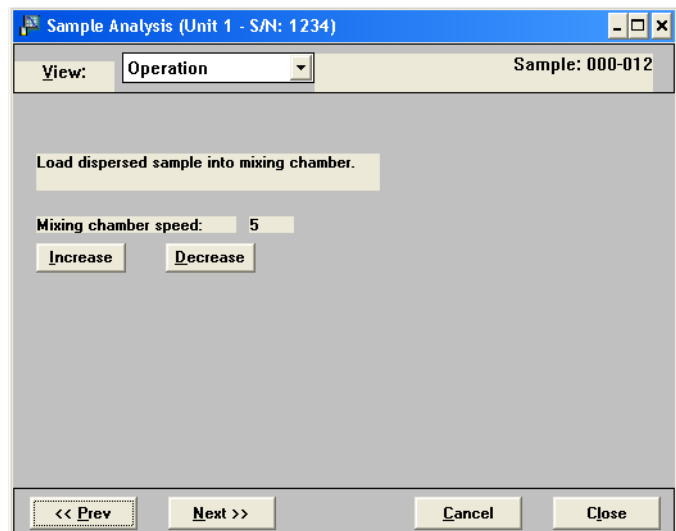
Allows you to leave liquid in the mixing chamber or leave the mixing chamber empty.

<b>Report Options</b>	This group box is used to designate report options.
<b>Report After Analysis</b>	Allows you to have a report(s) generated automatically after each analysis.
<b>Number of Reports</b>	Allows you to specify the number of reports you wish to have printed if you select <i>Printer</i> or <i>Printer/Plotter</i> for destination.
<b>Destination</b>	Choose a destination for report output.  Choices: <i>Screen</i> , <i>Printer</i> , <i>Printer/Plotter</i> , <i>File</i>
<b>File name</b>	This field is enabled only if you choose <i>File</i> as the destination. Enter a file name.

When you click **Next>>** from this window, a view of the analysis in progress is displayed. A baseline graph and a full-scale scan are displayed in the left side of the window, while sample data (as they are collected) are displayed in the right side of the window. Proceed to page 6-13 unless you checked the **Prepare Sedigraph to load sample** box.

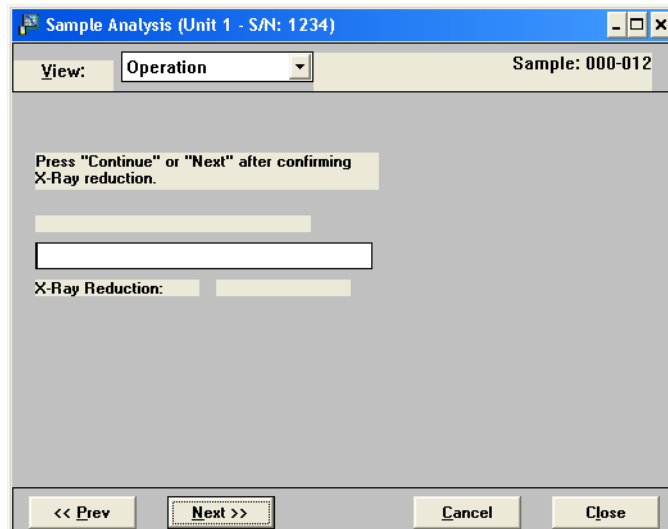


**If you selected Prepare SediGraph to load sample, a drain and load operation (described below) is performed, before the analysis begins.**



- Load your sample. If you want to change the mixing chamber speed, use the **Increase** or **Decrease** button.

b. Click **Next**. The following dialog is displayed.



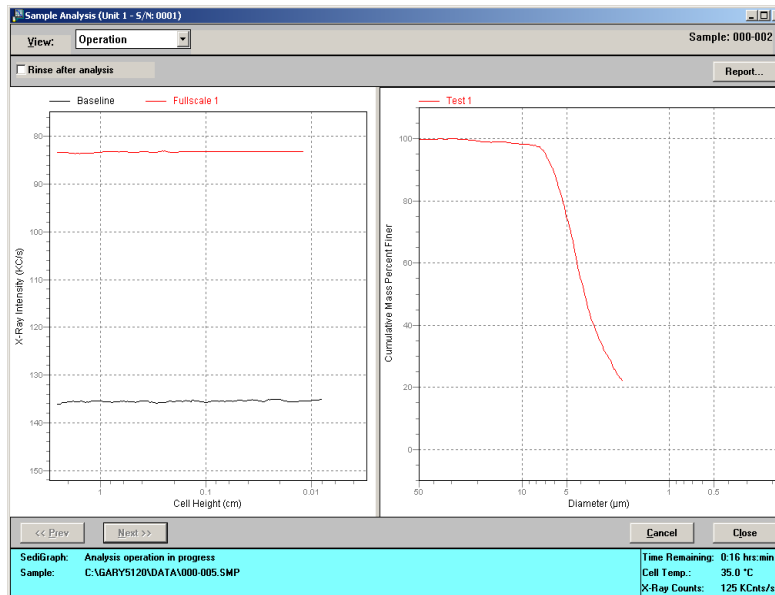
c. This dialog allows you to confirm the X-ray intensity reduction over the baseline before it completes. It shows the percent reduction in baseline intensity.

- If reduction is between 30 and 75%, *Good* is displayed. This indicates that the concentration level is appropriate.
- If the reduction is less than 30%, *Low* is displayed. This indicates that the concentration is too low; sample should be added.
- If the reduction is more than 75%, *High* is displayed. This indicates that the concentration is too high; more dispersant or less sample should be used.

When you are satisfied with the concentration level, click **Next>>**. A view of the analysis in progress is displayed. A baseline graph and full-scale scan are displayed in the left side of the window, while sample data (as they are collected) are displayed in the right side of the window.



If you have not specified to rinse after analysis, you may check the Rinse after analysis option any time while the analysis is in progress.



This window contains the results of the last sample analyzed. The left pane of the window displays the current baseline and full-scale scan, while the right pane displays a graph of mass % vs. particle size.



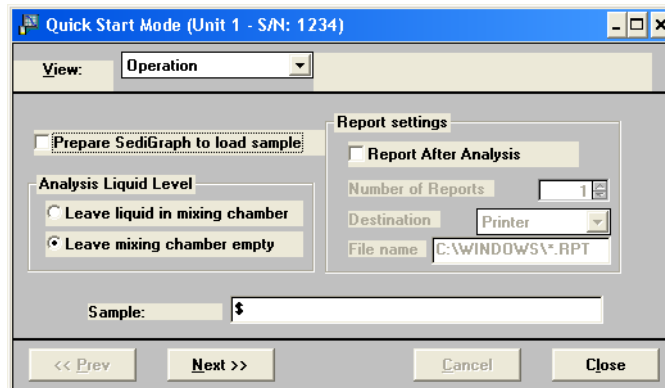
You may size either pane in the window by placing the mouse pointer on the center vertical bar and clicking the left mouse button. When the cursor changes to a 2-way arrow, pull the pane in the desired direction.



Displays the report(s) selected in the report options file.

## Quick Start

Use this mode of operation to analyze a series of samples of the same type which contain the same analysis conditions; sample files are created automatically. When you select this option from the Unit menu, the Quick Start Mode dialog is displayed.



- View** Allows you to choose which view you wish displayed in the window from a drop-down list. Refer to "View" on page 6-10.
- Prepare SediGraph to load sample** Select this option if you have not loaded the sample. If you select this option, an initial drain and load operation is performed.
- Analysis Liquid Level** Allows you to leave analysis liquid in the mixing chamber or leave the mixing chamber empty between samples.
- Report Settings** This group box is used to designate report options.
- Report After Analysis** Allows you to have a report(s) generated automatically after each analysis
- Destination** Contains a drop-down list of the available print destinations.
- If you select *Screen*, the file is displayed on the screen.
- If you select *Printer* or *Printer/Plotter*, select the number of copies to be printed. The requested file is sent to your default printer.



If you select *File*, the tabular reports of the requested file are converted to a text file which can be viewed with a text editor or other text file manipulation tools. You also must enter a name in the **File name:** field of the Settings group box.

### Sample

If you wish these automatically generated sample files to have a different string than the one specified in sample defaults, enter a name. Be sure to include the \$ symbol if you wish to have the sample number included as part of the name.

When you click **Next>>** on this window, a dialog prompting you to load the sample is displayed.



If you selected Prepare SediGraph to load sample, a drain operation is performed before the following dialog is displayed.

**Filename:** Defaults to the next sequenced sample number for the next analysis.

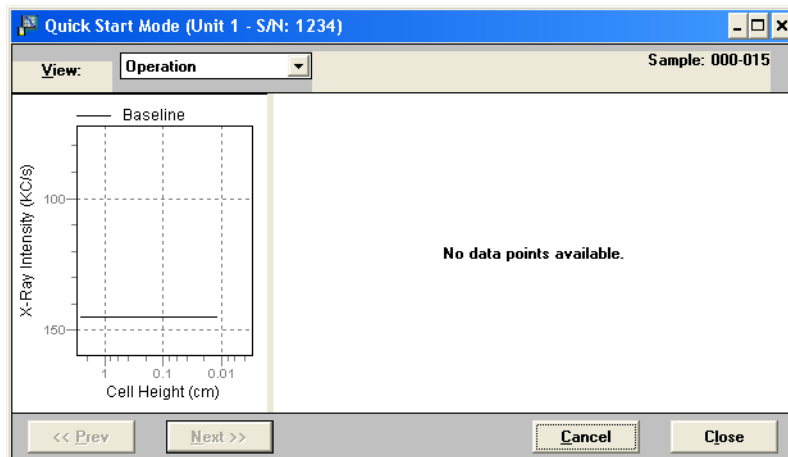
**Browse...**

Displays the Select Sample for Analysis dialog box, allowing you to select a sample file to use with your analysis. This option is used in the event you need to interrupt your sequence of samples to analyze a different sample.

**Sample:** Allows you to enter a name for the sample.

**Mixing chamber speed** Allows you to specify the mixing chamber stirrer speed using the **Increase** and **Decrease** push buttons.

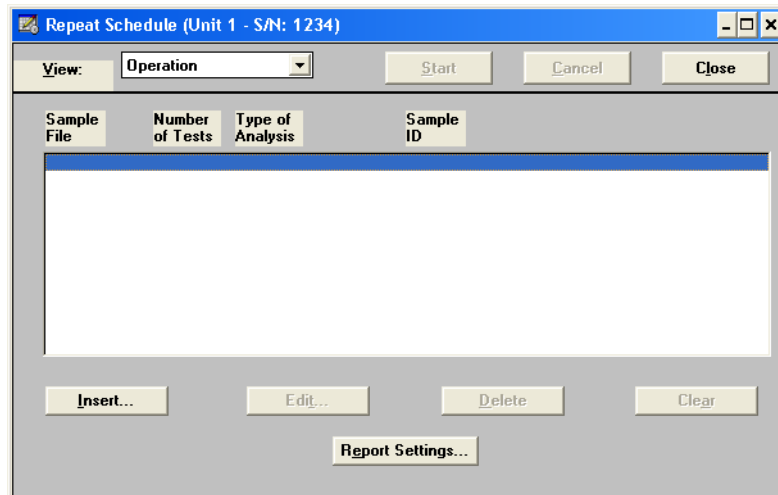
When you click **Next>>**, a view of the analysis in progress is displayed. A baseline graph and full-scale scan are displayed in the left side of the window, while sample data (as they are collected) are displayed in the right side of the window.



When the analysis is finished, the start next analysis view is displayed automatically so that you may proceed with the next analysis.

## Repeat Schedule

Use this mode of operation to perform multiple analyses on the same sample. When you select this option from the Unit menu, the Repeat Schedule dialog box is displayed.



### View

Allows you to choose which view you wish displayed in the window from a drop-down list. Refer to "View" on page 6-10.

An additional choice is also included in the drop-down list: *Analysis Results*, which displays the results of the current operation.

### Sample File Window

Displays the sample files you select for your analyses.

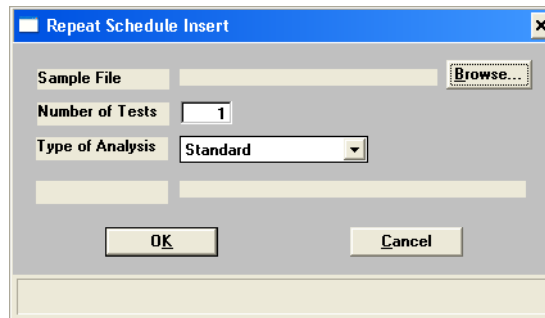


Begins the analysis.

When the analysis begins, the **Start** button changes to **Stop**. The **Stop** button cancels the remaining analyses. The analysis that is currently in progress will be completed.

**I**nsert...

Allows you to select the sample files you wish to use for the analyses. The Repeat Schedule Insert dialog box is displayed.



**B**rowse...

Displays a list of sample files. Select the file you wish to use, then click **OK**. The file is added to the list in the Repeat Schedule dialog.

### Number of Tests

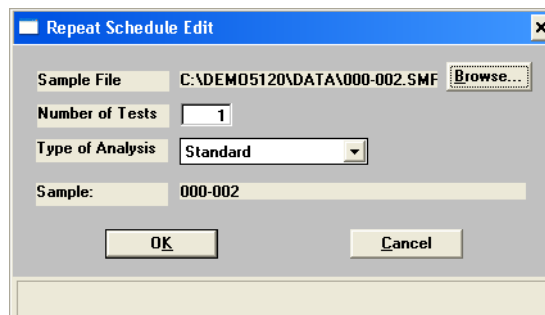
Enables you to enter the number of analyses you wish to perform using the selected sample information file.

### Type of Analysis

Enables you to select either *Standard*, *High Speed* or *High Resolution*.

**E**dit...

Allows you to edit the selected file. To select a file, click on the file in the list displayed in the Repeat Schedule dialog, then select **Edit**. The Repeat Schedule Edit dialog box is displayed.



You can change the number of tests or the type of analysis. Make your changes, then click **OK**.



Allows you to delete unwanted files. Simply select the file you wish to delete, then click **Delete**. This push button is disabled if no file is selected.



Allows you to remove all of the entries in the window at one time. They do not have to be selected.



Displays the Report Settings dialog box from which you may choose report options. Selected report options will be generated automatically after each analysis.

You may view the analyses in progress by selecting *Analysis Results* in the **View** drop-down list.

## MasterTech Automatic



This option is functional only if you have a MasterTech connected to your analyzer.

Use this mode of operation to analyze a series of samples of the same type which contain the same analysis conditions; sample files are created automatically. When you select this option from the Unit menu, the MasterTech Automatic Mode dialog box is displayed.

### Start with beaker

Allows you to enter the position number of the beaker containing the first sample to be analyzed. This field is disabled if an analysis is in progress.


### Sample resuspension Group Box

This group box is used to enter resuspension parameters. All fields in this group box are disabled if an analysis is in progress.

Samples tend to settle in the beaker while waiting for analysis, especially if samples are prepared ahead of time, as in most cases when using a MasterTech. The options in this group box allow you to program the MasterTech stirrer and probe to redisperse the sample before analysis.

### Stirrer time

Allows you to enter the number of seconds to have the stirrer operate during resuspension.

<b>Stirrer speed</b>	Allows you to choose stirrer speed. Coarse materials and less-stable dispersions may require more high-speed stirring time than finer materials.
<b>Probe time</b>	Allows you to enter how long to have the ultrasonic probe operate during resuspension. Coarse materials and less-stable dispersions may require more probe time than finer materials.
<b>Report Settings Group Box</b>	This group box is used to designate report output. The fields contained on this group box are disabled if analyses are in progress.
<b>Report After Analysis</b>	Allows you to have a report(s) generated automatically after each analysis.
<b>Number of Reports</b>	If select <i>Printer</i> or <i>Printer/Plotter</i> for destination, allows you to enter the number of reports you wish to have printed.
<b>Destination</b>	Specify a report destination.  Choices: <i>Screen</i> , <i>Printer</i> , <i>Printer/Plotter</i> , <i>File</i>
<b>File name</b>	If you selected <i>File</i> at the Destination prompt, enter a file name.
<b>Sample</b>	Allows you to enter the name and default string you wish to have applied to the sample files of the current series of analyses.  You can include the beaker number containing the sample in the sample identification by entering # within the name you specify. For example, <i>Sample in beaker #</i> .
	Begins the analysis.  When the analysis begins, the <b>Start</b> button changes to <b>Stop</b> . When you press <b>Stop</b> , the current analysis and the next queued analysis will be performed, then the remaining analyses in the queue will be canceled.

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## MasterTech Schedule

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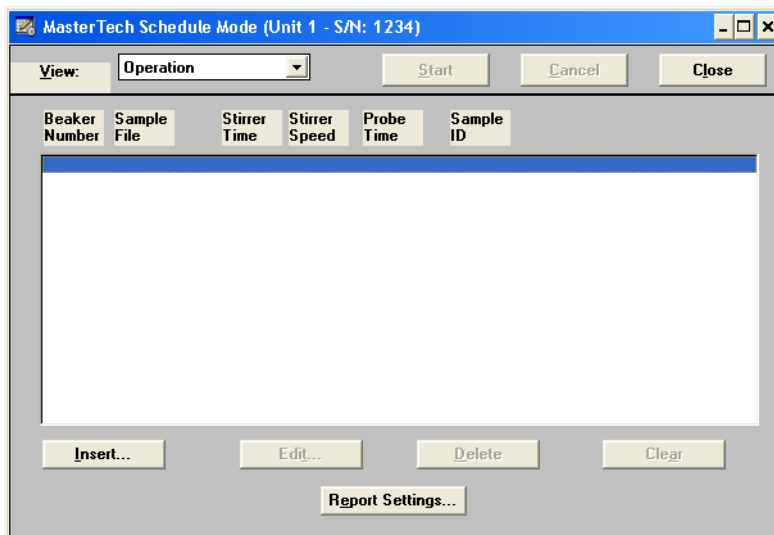


This option is functional only if you have a MasterTech connected to your analyzer.

Use this mode of operation to:

- Analyze a series of samples which may be different in size and shape and, consequently, require different analysis conditions
- Perform a series of baseline measurements
- Analyze samples and measure a baseline alternately

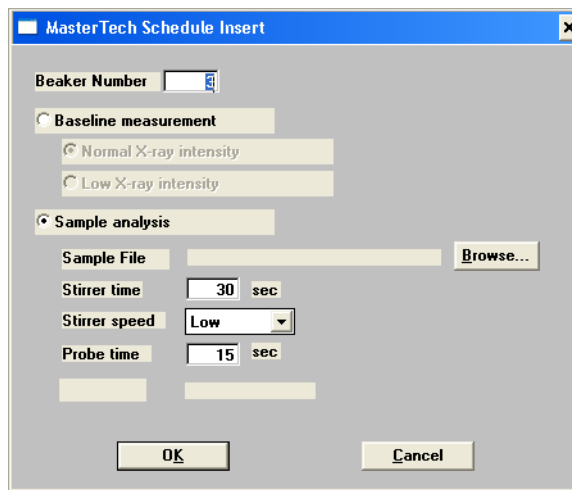
When you select this option from the Unit menu, the MasterTech Schedule Mode dialog is displayed.





A rectangular button with a thin border and the text "Insert..." centered inside.

Allows you to select the sample files you wish to use for the analyses; the MasterTech Schedule Insert dialog box is displayed.



If you have a sample file selected in the Sample File window, the new file will be inserted before the selected file; otherwise it will be inserted at the end of the list.

### **Beaker Number**

Allows you to enter the beaker number containing the selected sample (or baseline liquid).

### **Baseline measurement or Sample Analysis**

Allows you to specify either a baseline measurement or sample analysis for the specified beaker.

If you select **Baseline measurement**, select the X-Ray intensity.

The **Normal** selection increases intensity when using high X-ray absorption liquids, such as water.

The **Low** selection decreases intensity when using low X-ray absorption liquids, such as hydrocarbons.

If you select **Sample analysis**, click **Browse**, then choose the sample file you wish to use with the sample in this beaker position.



You may wish to use this option if you plan to change dispersing agents with one of the samples. This way you could schedule a baseline measurement using the beaker preceding the one containing the different dispersant. For example, if you plan to change dispersing liquids in beaker position #4, schedule a baseline measurement in beaker position #3.

**Stirrer time**

Allows you to enter the number of seconds to have the stirrer operate during resuspension.

**Stirrer speed**

Allows you to choose stirrer speed. Coarse materials and less-stable dispersions may require more probe time than finer materials.

**Probe time**

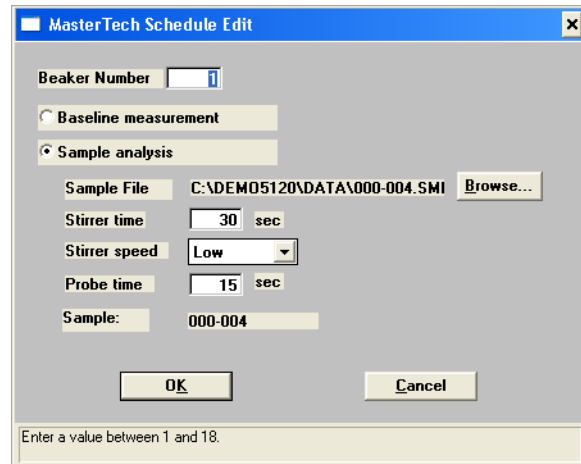
Allows you to enter how long to have the ultrasonic probe operate during resuspension. Coarse materials and less-stable dispersions may require more high-speed stirring time than finer materials.

**Sample**

Displays the sample identification string of the selected sample file.



Allows you to edit a sample file or dispersion conditions. The MasterTech Schedule Edit dialog box is displayed.



The fields on this dialog box are identical to the fields on the MasterTech Schedule Insert dialog box explained on above. The only difference is the **Sample File** field, which displays the sample file you are editing.



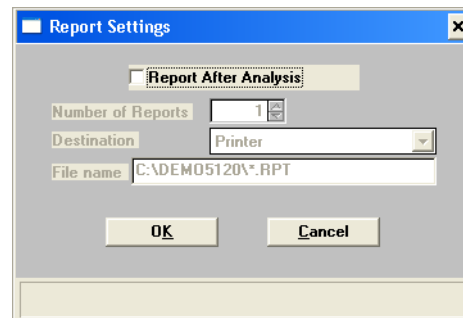
Allows you to delete any unwanted files. Simply select the file you wish to delete, then click **Delete**. This push button is disabled if a file is not selected.



Removes all of the files listed in the window. The files do not have to be selected



Allows you to choose report options. Reports are generated automatically after each analysis. When you click on this push button, the Report Settings dialog box is displayed.



### Report After Analysis

Allows you to have a report(s) generated automatically after each analysis.

**Number of Reports**

If select *Printer* or *Printer/Plotter* for destination, allows you to enter the number of reports you wish to have printed.

**Destination**

Specify a report destination.

Choices: *Screen, Printer, Printer/Plotter, File*

**File name**

If you select *File* for destination, enter a file name.



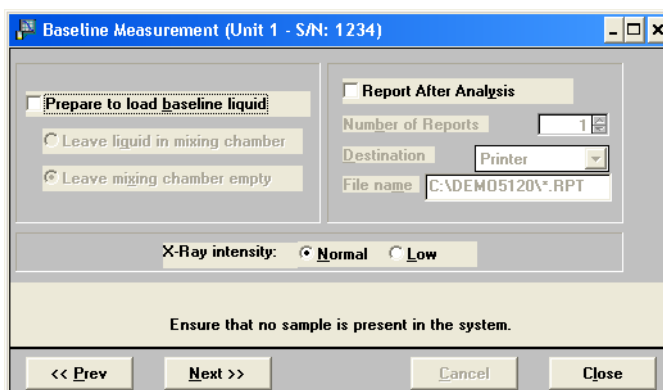
Begins the analysis.

When the analysis begins, the **Start** button changes to **Stop**. When you press **Stop**, the current analysis and the next queued analysis will be performed, then the remaining analyses in the queue will be canceled

## Baseline

Before you can perform an analysis, you must have a baseline measurement for data collection. It is not necessary to measure a baseline for each analysis. Micromeritics recommends that you perform a baseline measurement at the change of each shift or if you change dispersing agents. You may perform up to seven measurements; however, you may use only the last one obtained.

When you select **Baseline** from the Unit menu, the Baseline Measurement dialog is displayed.



### Prepare to load baseline liquid

Select this option if you have not loaded your baseline liquid.

### Leave liquid in mixing chamber Leave mixing chamber empty

Choose whether you wish to leave liquid in the mixing chamber or if you wish to leave the mixing chamber empty.

### Report After Analysis

Allows you to have a report(s) generated automatically after each analysis.

### Number of Reports

If select *Printer* or *Printer/Plotter* for destination, allows you to enter the number of reports you wish to have printed.

### Destination

Specify a report destination.

Choices: *Screen, Printer, Printer/Plotter, File*

**File name**

If you selected *File* at the Destination prompt, enter a file name.

**X-Ray intensity**

Select the X-ray intensity setting.

The **Normal** selection increases intensity when using high X-ray absorption liquids, such as water.

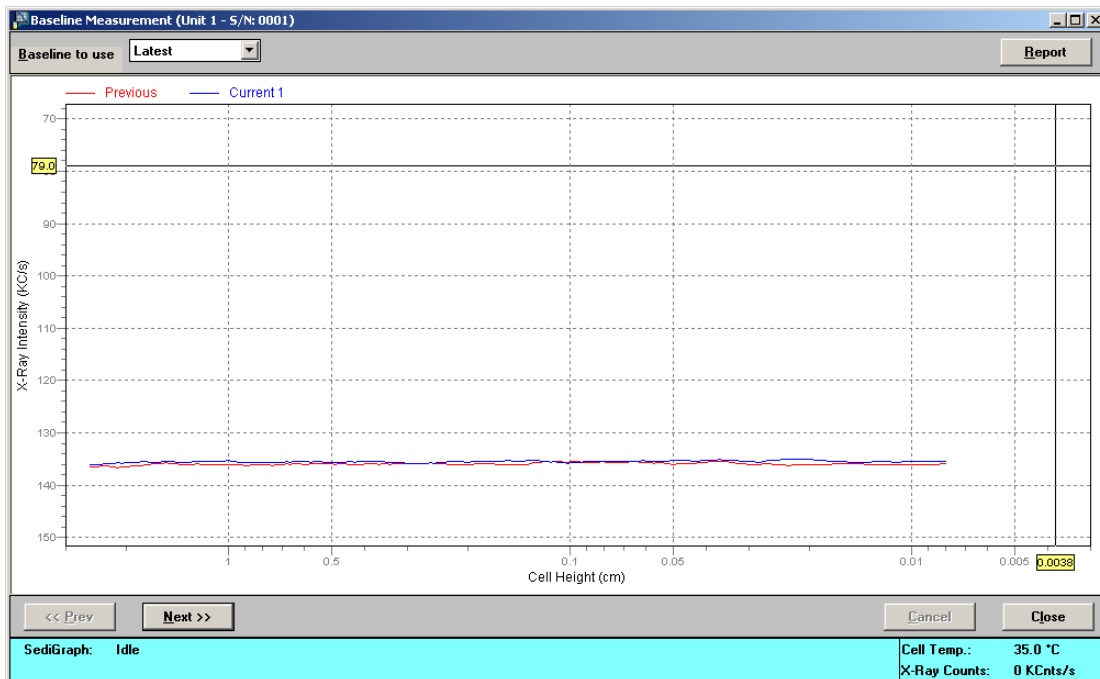
The **Low** selection decreases intensity when using low X-ray absorption liquids, such as hydrocarbons.

When you click **Next>>** on this dialog box, the baseline measurement begins; a window is displayed so that you may view the baseline in progress.



**If you checked *Prepare to load background liquid*, a drain and load operation is performed before the baseline measurement begins. Load the baseline liquid when prompted, then press Next>>; the baseline measurement begins.**

When the baseline measurement is finished, a window containing the baseline is displayed.



**Baseline to use**

Select whether you wish to use the latest or the previous baseline.

Choose *Latest* to use the last baseline performed.

Choose *Previous* to use the baseline which was active before the last series of baselines were performed.



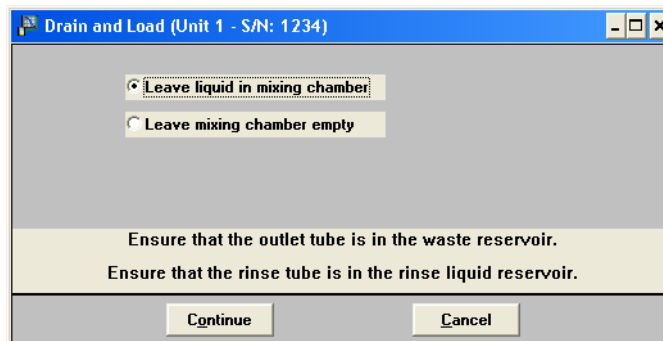
Advances to the Start baseline window so that you may perform another baseline

## Drain and Load

Before you can collect baseline data or perform an analysis, you must drain the SediGraph 5120 of any previous sample (or baseline liquid), then reload a sample (or baseline liquid). You may perform this operation using one of the following methods:

- *Prior to a baseline collection or an analysis*, select **Drain and Load SediGraph** from the Unit menu (the method explained in this section).
- *At the beginning of a baseline collection*, select the **Prepare to load baseline liquid** check box on the Baseline Measurement dialog box.
- *At the beginning of an analysis*, select the **Prepare SediGraph to load sample** check box on the Select Drain and Load dialog box.

When you select **Drain and Load** from the Unit menu, the Drain and Load dialog is displayed.

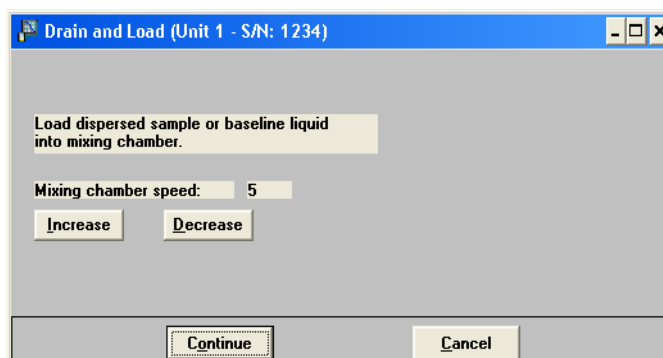


### Mixing chamber radio buttons

Allows you to choose whether you wish to leave liquid in the mixing chamber or if you wish to leave the mixing chamber empty.



Select this push button to continue the operation.



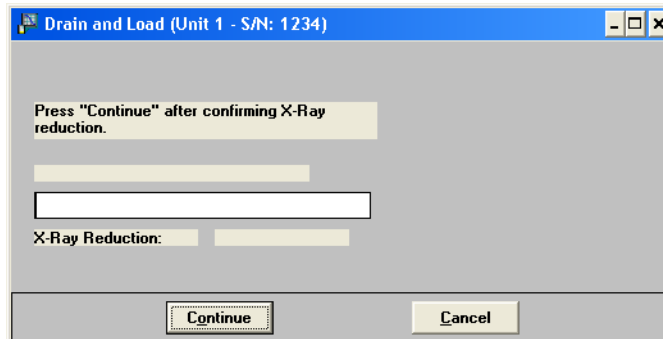


**Mixing chamber speed**

You can specify the speed of the mixing chamber stirrer using the **Increase** and **Decrease** buttons.



Select this push button to continue the operation.



This dialog allows you to confirm the X-ray intensity reduction over the baseline before it completes.

- If reduction is between 30 and 75%, *Good* is displayed. This indicates that the concentration level is appropriate.
- If the reduction is less than 30%, *Low* is displayed. This indicates that the concentration is too low; dispersant should be added to the sample.
- If the reduction is more than 75%, *High* is displayed. This indicates that the concentration is too high; less dispersant or more sample should be used.

When you are satisfied with the X-ray reduction level, click **Continue** and the cell will move to the normal park position and the load operation will be complete.

---

## Rinse

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This option cannot be performed when an analysis is in progress.

A rinse operation should be performed to rinse the analysis cell, mixing chamber, and tubing of any contaminants or sample materials from the previous analysis.

When you select **Rinse** from the Unit menu, three choices are available:

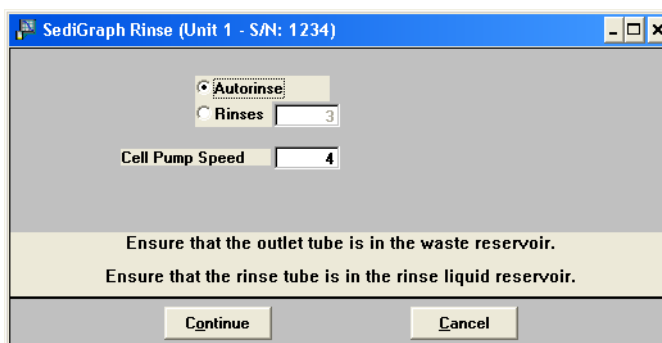
- **SediGraph** - rinses the analysis cell, mixing chamber, and the SediGraph tubing.
- **MasterTech** - rinses the MasterTech tubing.
- **Both** (SediGraph and MasterTech) - rinses the analysis cell, mixing chamber, the SediGraph tubing, and the MasterTech tubing.

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## SediGraph

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Select SediGraph; the SediGraph Rinse dialog box is displayed.



### Rinse Cycles

*Autorinse* (by default) performs up to three cycles of three rinses each (a total of nine rinses) in an attempt to reestablish baseline conditions. If conditions are not reestablished after nine rinses, an error message is displayed. Refer to "Autorinse" in Chapter 8 to change Autorinse defaults.

*Rinses* allows you to specify the number of rinses to be performed. You may choose up to five rinses.

**Cell Pump Speed**

Allows you to enter the speed for the cell pump to operate during rinsing. The range is 1 to 5, with 1 being the slowest.



Begins the rinse operation; a message is displayed indicating a rinse operation is in progress. When rinsing is complete, the dialog box closes.

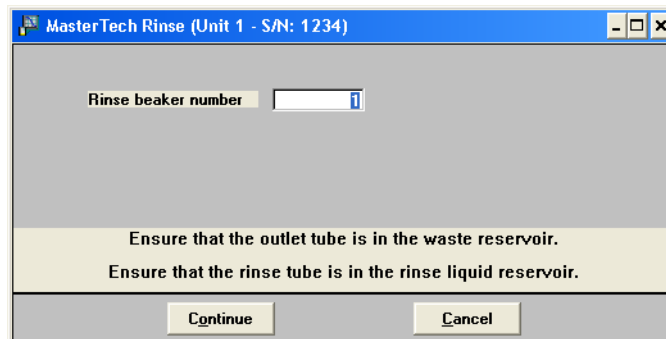
## MasterTech

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This option is available only if you have a **MasterTech** connected to your analyzer and analyses are not in progress.

Select **MasterTech**; the MasterTech Rinse dialog box is displayed.


**Rinse beaker number**

Allows you to enter the position number of the beaker you wish to rinse into. Make sure the beaker is empty.

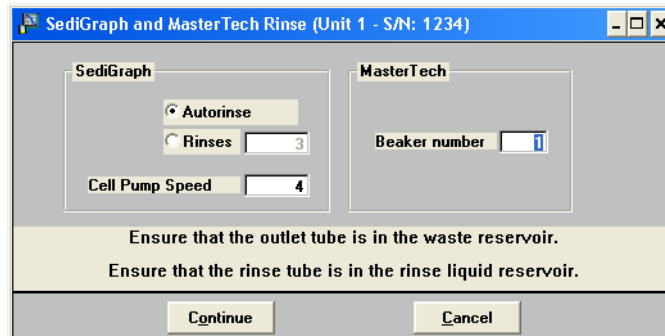
*Range: 1 to 18*



Begins the rinse operation; a message is displayed indicating a rinse operation is in progress. When rinsing is complete, the dialog box closes.

## Both

Select **Both**; the SediGraph and MasterTech Rinse dialog box is displayed.



### SediGraph Group Box

*Autorinse* allows you to have the analyzer automatically determine how many rinse cycles to perform.

*Rinses* allows you to specify the number of rinses to perform. You may choose up to five rinses.

### Cell Pump Speed field

Allows you to enter the speed at which you wish the cell pump to operate during rinsing. The range is 1 to 5, with 1 being the slowest.

### MasterTech Group Box

Allows you to enter the position number of the beaker you wish to rinse into. Ensure that the beaker is empty.

**Continue**

Begins the rinse operation; a message is displayed indicating a rinse operation is in progress. When rinsing is complete, the dialog box closes.

---

## Initialize MasterTech

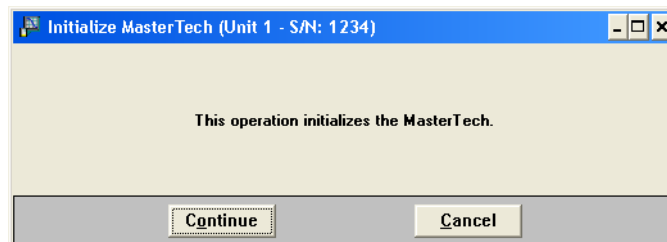
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Select this option if:

- You wish to perform manual operations with the MasterTech
- The MasterTech beaker tray has been disturbed

When the MasterTech is initialized, the tray is aligned so that beaker #1 is in the starting position.

Select **Initialize MasterTech** from the Unit menu; the Initialize MasterTech dialog box is displayed.



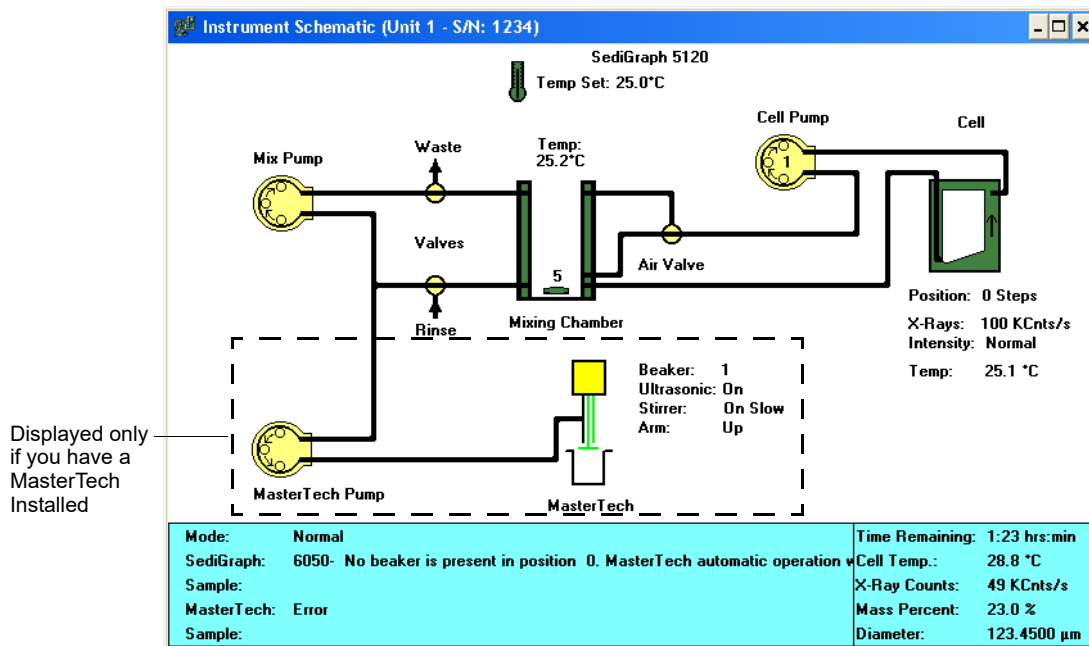
Begins initialization; a message is displayed indicating that initialization is in progress. When initialization is complete, the dialog box closes.

## Enable Manual Control

Select this option to manually control your system. If the instrument schematic is not displayed, select **Unit [n] > Show Instrument Schematic**.



**Manual Control is disabled if an automatic operation is in progress.**



When you enable manual control, the symbols for valves and pumps change color on the control screen to indicate manual operation.

- Valves: Closed = Yellow Open = Green
- Pumps: Off = Yellow On = Green Disabled by front panel switch = Red

Use one of the following options to move among the system components depicted on the control screen:

- **Mouse operation:** move the pointer to the desired component and click the left mouse button once.
- **Keyboard operation:** move to the desired component using the arrow keys or **Tab**.

Each component has a pop-up menu displaying the operations available for that particular component. These menus may be accessed by selecting the desired component, then clicking

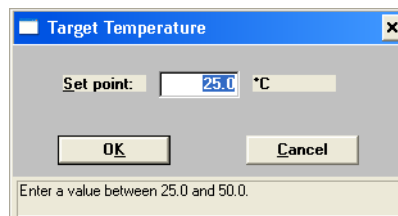
the right mouse button. You also may use the shortcut keys: **Shift + F9**.

The options available for the components on the instrument schematic are:

### Temp Set

#### *Set Temperature*

Enables you to set the target temperature. The Set Temperature dialog is displayed.



#### **Set point**

Enter a temperature set point.

*Range 25.0 to 50.0°C*



**The set point must be at least 10°C above ambient temperature for accurate control.**

### Mix Pump

#### *Turn On*

#### *Turn Off*

Enables you to turn the mixing pump on or off.

### Waste Valve

#### *To Waste*

#### *To Mixing Chamber*

Allows you to set the waste valve position.

### Rinse Valve

#### *From Rinse*

#### *From Mixing Chamber*

Allows you to set the rinse valve position.

### Mixing Chamber

The speed of the mixing chamber magnetic stirrer can be set from 1 to 10, with 1 being the lowest speed.

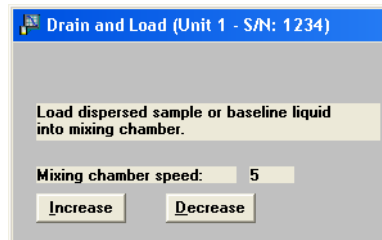
#### *Increase Speed*

#### *Decrease Speed*

Enables you to increase or decrease the mixing stirrer speed. Each time you click *Increase Speed* or *Decrease Speed* the setting is incremented or decremented by one.

*Set Speed*

Displays the Mixing Chamber Speed dialog.

*Speed*

Enables you control the stirrer speed by entering a value from 1 to 10.

*Turn On**Turn Off*

Enables you to turn the stirrer on or off.

**Air Valve***Top**Bottom*

Enables you to set the position of the air valve.

**Cell Pump***Turn On**Turn Off*

Enables you to turn the cell pump on or off.

*Flow Up in Cell**Flow Down in Cell*

Enables you to change flow direction. When you change the direction, the arrows in the pump symbol change to show the current direction.

*Increase Speed**Decrease Speed*

Enables you to change the speed of the cell pump.

The speed of the cell pump can be set from 1 to 5, with 1 being the slowest speed.

Each time you click *Increase Speed* or *Decrease Speed* the setting is incremented or decremented by one.



**Cell**

*Move Up Slow*

*Move Up Fast*

*Move Down Slow*

*Move Down Fast*

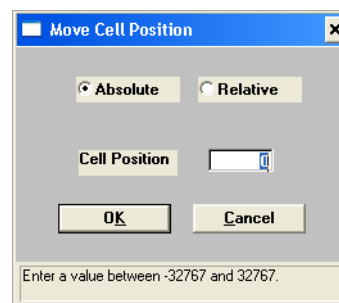
*Move to Zero*

*Move to Load*

Enables you to control the movement of the analysis cell. An arrow in the cell symbol indicates the direction of cell movement.

*Move Cell Position*

Enables you to enter the cell position. When you choose this option, the Move Cell Position dialog displays.



*Absolute*

Enables you to move the cell position to an absolute (relative to the last beamsplit location) number of steps. For example, an absolute move of 100 steps moves the cell 100 steps above beamsplit.

*Relative*

Enables you to move the cell position to a relative (relative to current position) number of steps. For example, a relative move of 100 steps moves the cell up 100 steps from its current position.

*Cell Position*

Enables you to move the cell to the position you enter in this field.

Range: -32767 to 32767

*Stop Motion*

Stops cell movement.

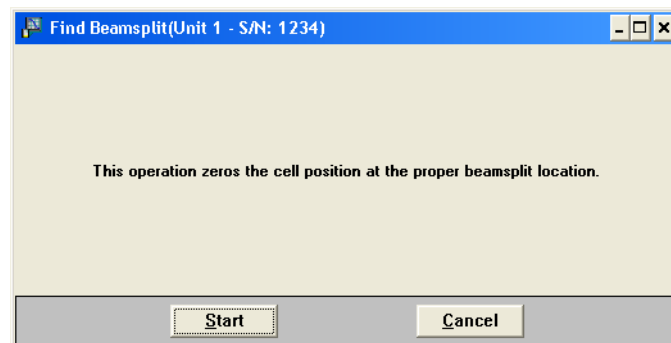
*X-Ray Intensity Normal**X-Ray Intensity Low*

Enables you to select the X-ray intensity setting.

*Find Beamsplit*

Zeros the cell position at the proper beamsplit location.

The Find Beamsplit dialog is displayed.



Click **Start**. Progress messages are displayed, then a dialog similar to the one shown below is displayed.



Click **Done** to close the dialog.

**MasterTech**

(shown only if a MasterTech is installed)

*Move Arm Up**Move Arm Down*

Enables you to control the movement of the MasterTech arm.

*Ultrasonic On**Ultrasonic Off*

Enables you to turn the ultrasonic probe on or off.

*Stirrer On*

*Stirrer Off*

Enables you to turn the stirrer in the beaker on or off.

*Stirrer Speed Fast*

*Stirrer Speed Slow*

Enables you to control the stirrer speed.

*Move to next beaker*

Enables you to move the MasterTech arm to the next beaker position.

**MasterTech Pump**

(shown only if a MasterTech is installed)

*Turn On*

*Turn Off*

Enables you to turn the MasterTech pump on and off.

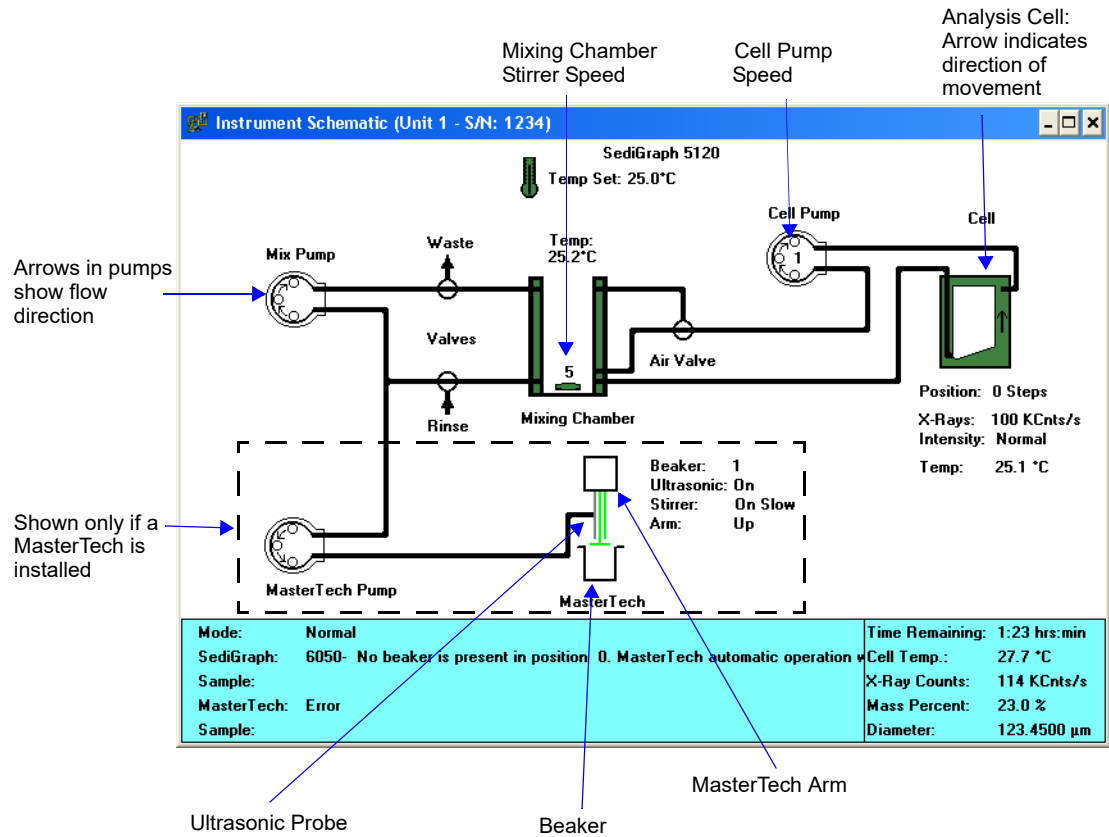
*Flow Direction Rinse*

*Flow Direction Load*

Enables you to set the flow direction of the MasterTech pump. When you change the direction, the arrows in the pump symbol change to show the current direction.

## Show Instrument Schematic

Select this option to display a schematic of the SediGraph 5120 and the MasterTech (if one is being used).



You can determine the state of the valves and pumps by color.

- Valves Closed = White      Open = Green
- Pumps: Off = White      On = Green      Disabled by front panel switch = Red

---

## Show Status

---

Select this option to show just the status display of an operation in progress; a status window similar to this one is displayed.

<b>Mode:</b>	Normal	<b>Time Remaining:</b>	1:23 hrs:min
<b>SediGraph:</b>	Analysis operation in progress	<b>Cell Temp.:</b>	34.5 °C
<b>Sample:</b>		<b>X-Ray Counts:</b>	114 KCnts/s
<b>MasterTech:</b>	Waiting to resuspend sample in beaker 3	<b>Mass Percent:</b>	23.0 %
<b>Sample:</b>		<b>Diameter:</b>	123.4500 µm

You may wish to use this option if:

- You have an automatic operation in progress and you decide to edit a sample file, for example. This way, you can keep up with the status of your operation while performing another task.
- You have two units attached to your computer. You can select **Show Status** on each unit menu and have the status for both units displayed at one time.

The following are items that may appear in the status display, depending on your instrument and the operation in progress.

<b>Mode:</b>	Displays the type of operation being performed.
<b>SediGraph:</b>	Displays the status of the analyzer, such as <i>Analysis operation in progress</i> , <i>Idle</i> , <i>Waiting for load</i> , etc.
<b>Sample:</b>	Displays the name of the sample file involved in the operation. This field also displays for the MasterTech if one is being used.
<b>MasterTech:</b>	Displays the status of the MasterTech. This field is visible only when a MasterTech is being used.
<b>Time Remaining:</b>	Displays the time remaining on the analysis. This field is visible only when an analysis is in progress.
<b>Cell Temp.:</b>	Displays the temperature of the liquid in the analysis cell.
<b>X-Ray Counts:</b>	Displays the intensity of the X-ray in kilocounts/sec.
<b>Mass Percent:</b>	Displays the current mass percent in the analysis.

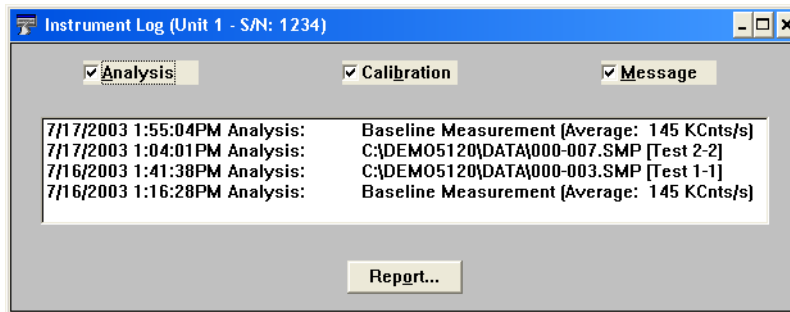
**Mode:** Displays the type of operation being performed.

**Diameter:** Displays the current particle size in the analysis.

**Analysis Time:** Displays the approximate time for the analysis.

## Show Instrument Log

Select this option to display a log of recent analyses, calibrations, and errors or messages. By default, this information is logged for a 7-day period for analyses and a 30-day period for messages and calibrations. You may change the time for which this information is retained in the Unit section of the WIN5120.INI file.

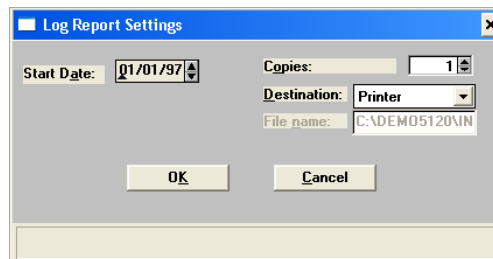


You can choose the type of information to display in the window by selecting only the desired item(s). For example, check the **Analysis** box only to restrict the display to analysis information.

**Analysis, Calibration, and Message Checkboxes** Enables you to select the log contents to display.



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



**Start Date**

Enables you to select the start date for log entries to be included in the report. You can specify a start date using any of the following methods:

- Highlight the field (or press **F2** to clear the field) and type in the desired date.
- Double-click the field (or press **F4**) to display a calendar and choose a date.
- Press **F2** to clear the field, then **F3** to insert the current date.

**Copies**

If you select *Printer* or *Printer/Plotter* for destination, allows you to enter the number of reports you wish to have printed.

**Destination**

Specify a report destination. Choices: *Screen*, *Printer*, *Printer/Plotter*, *File*

**File name**

If you select *File* for destination, enter a file name.

## Unit Configuration

Select this option to display baseline information, as well as the software and hardware configuration, of the connected analyzer. When you select Unit Configuration from the Unit menu, the Unit Configuration dialog box is displayed.

### Software Versions Group Box

Displays the software versions of the MICBIOS and SediGraph analysis program.

### Configuration Group Box

Displays the number of the port being used to control the analyzer and the serial number of the selected analyzer.

### Baseline Group Box

Displays the date and the average intensity of the last baseline performed.



### Analyses per tubing set Group Box

#### Enable analyses counter

Allows you to enable or disable the analyses counter. The analysis program keeps a counter of the number of analyses remaining on the instrument before the next recommended tubing change. For every sample information file for which an analysis is started (does not include service tests or baseline measurements) this counter is decremented.

#### Max Recommended analyses per tubing set

Allows you to enter the maximum number of analyses to be performed before the application displays this message:

**The maximum number of analyses for this tubing has been reached. It is time to change the tubing. When the tubing has been replaced, reset the counter in the unit configuration dialog.**

#### Analyses remaining on current tubing

Displays the number of analyses remaining before the maximum recommended number is reached.

**Reset**

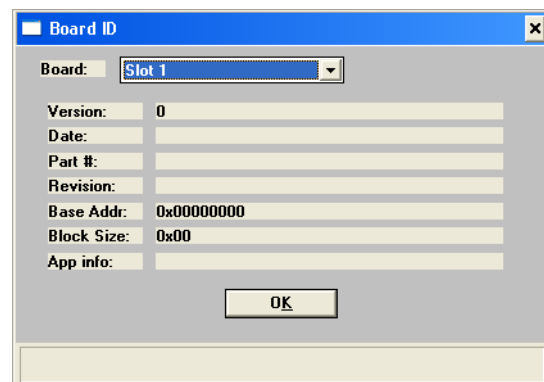
Resets the analyses counter to the recommended maximum number.

### Calibrations Group Box

Displays calibration data.

**Board ID...**

Displays the Board ID dialog, which describes the circuit boards in the analyzer.

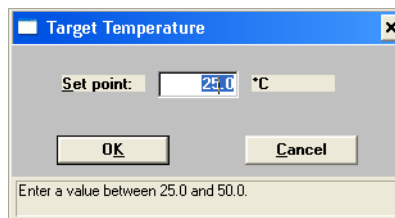


#### Board

A drop-down list that enables you to select the board you want to view.

A rectangular button with a thin border and the text "Set Temperature ..." inside.

Enables you to set the target temperature.



Enter the temperature, then click **OK**.

---

## Calibration

---

The Calibration option provides a method of storing instrument calibration data. Your Micromeritics service representative may use this option to enter calibration data for future reference when servicing the analyzer.

This option is enabled only when the analysis program is operating in Service Test mode (refer to **Service Test Mode** in Chapter 8).

---

## Service Test

---

Certain service tests are included in the operating program, but can be performed only with the assistance of a trained Micromeritics service representative. These tests are designed to provide your service representative with instrument readouts, as well as to assist him in troubleshooting potential problems and, perhaps, eliminating unnecessary repair services. This service strategy allows you to conduct expert tests in less time than it would take to be properly trained in servicing the instrument.

This option is enabled only when the analysis program is operating in Service Test mode (refer to **Service Test Mode** in Chapter 8)

## 7 REPORTS MENU

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## Overview

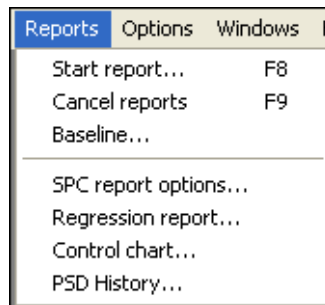
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This chapter describes the options contained on the Reports menu and the type of reports available; and contains samples of generated reports.

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## Description

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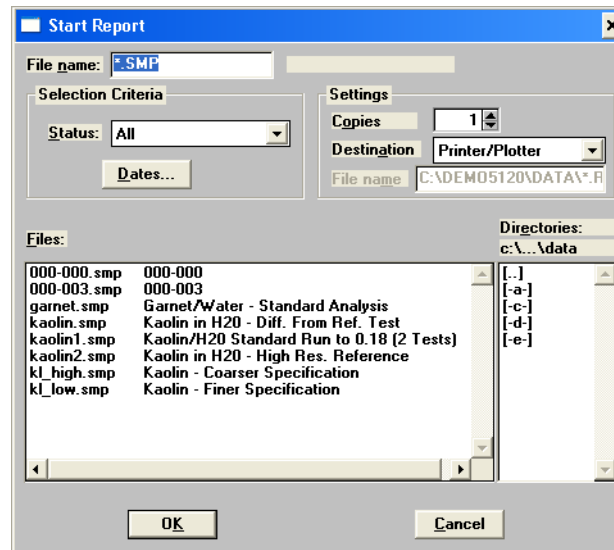


Listed below are brief descriptions of the options contained on the Reports menu. Detailed descriptions follow this section.

<b>Start report</b>	Allows you to generate a report on a completed sample analysis.
<b>Close reports</b>	Closes all open report windows.
<b>Baseline</b>	Allows you to generate a report on the current baseline for the selected unit.
<b>SPC report options</b>	Allows you to specify the sample data to be included in SPC reports.
<b>Regression report</b>	Allows you to generate a regression report.
<b>Control chart report</b>	Allows you to generate a control chart report.
<b>PSD history</b>	Allows you to generate a particle size distribution history report.

## Start Report

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



**File name:** The name you select from the **Files:** list box is displayed in this field. If you select multiple files, only the last one selected is displayed.

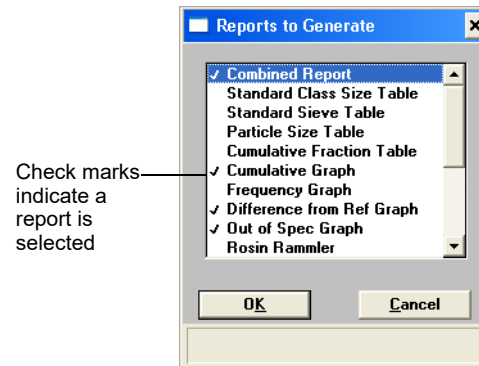
**Status** Refer to "Selecting Files" in Chapter 2 for a description of the **Status** field and **Dates** push button.

**Settings** Refer to "Selecting the Report Destination" in Chapter 3.

**Files: list box** Displays a list of the available sample files for the choice shown in the **Status** field.

**Directories:** Displays a list of available drives and directories. The drive and directory last accessed is displayed immediately above the **Directories:** list box.

If you choose a single sample file, the Reports to Generate dialog is displayed when you click **OK**. The reports selected are the ones you specified in the sample file. This dialog allows you to deselect reports or select additional ones.



Double-click on the report(s) you wish to select (or deselect). A check mark is placed before each selected report. Pressing the **Spacebar** performs the same function. After you make your report selection and click **OK**, the requested reports are sent to the specified destination.

If you choose more than one file, this dialog is not displayed. The reports you specified in the sample file will be generated and sent to the specified destination.

---

## Close Reports

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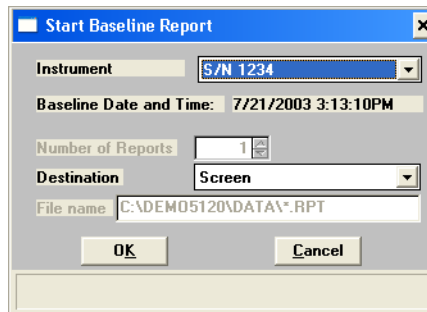
This option enables you to close all open report windows at one time. This avoids having to select **Close** on each report window. This option is unavailable if reports are being generated.

---

## Baseline

---

This option allows you to generate a baseline report for the specified instrument. The Start Baseline Report dialog is displayed.

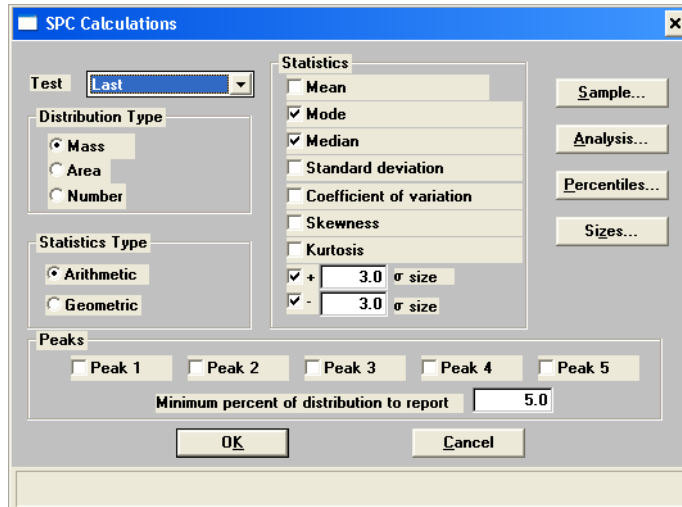


- |                               |  |
|-------------------------------|--|
| <b>Instrument</b>             | Displays a drop-down list of the attached instruments.       |
| <b>Baseline Date and Time</b> | Displays the date and time of the last baseline measurement. |
| <b>Destination</b>            | Refer to "Selecting the Report Destination" in Chapter 3.    |



## SPC Report Options

When you select SPC Report Options, the SPC Calculations dialog is displayed.



### Test

Drop-down list containing analysis choices for SPC calculations.

*Last* reports statistics for the last analysis in the sample file(s).

*First* reports statistics for the first analysis in the sample file(s).

*Average* reports an average based on all analyses in the sample file(s).

### Distribution Type Group Box

Allows you to choose the type of distribution data for which the SPC variables are to be computed.

### Statistics Type Group Box

Allows you to choose the type of statistics for which the SPC variables are to be calculated.

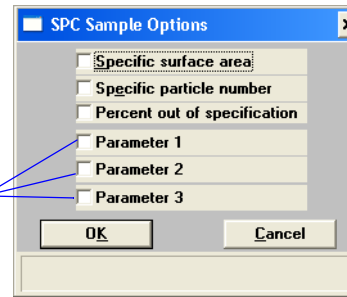
### Statistics Group Box

Displays a list of the variables available for SPC reporting; you may choose as many as you wish.

**S**ample...

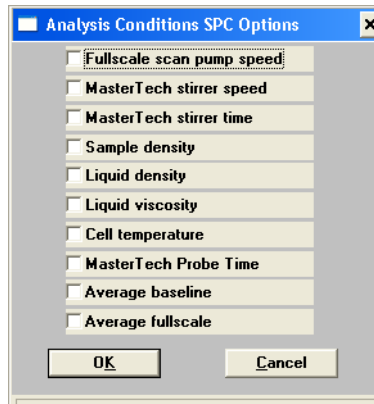
Displays the SPC Sample Options dialog, allowing you to select the sample parameters you wish to have reported.

Specific parameters can be designated in these fields. Refer to **Sample Defaults** in Chapter 8 for additional information.



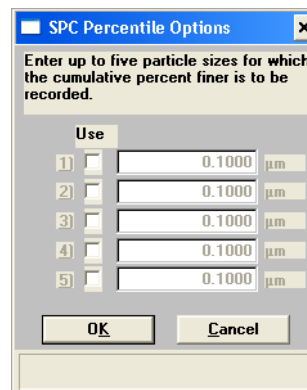
**A**nalysis...

Displays the SPC Analysis Options dialog, allowing you to select the analysis conditions you wish to have reported.



**P**ercentiles...

Displays the SPC Percentile Options dialog, allowing you to specify up to five sizes at which the percentiles are to be reported.



**Sizes...**

Displays the SPC Size Options dialog, allowing you to specify the percentiles at which the sizes are to be reported.

Use		
1) <input checked="" type="checkbox"/>	50.0	%
2) <input type="checkbox"/>	100.0	%
3) <input type="checkbox"/>	100.0	%
4) <input type="checkbox"/>	100.0	%
5) <input type="checkbox"/>	100.0	%

**Peaks**

Enables you to choose the peaks to include in the SPC calculations; you can choose up to five. Use the field below to enter the minimum percentage of the distribution to report.

## Regression Report

Select this option to generate a 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. The graphs for the regression report are scaled so that all three fit on a single page. If you choose less than three, the graphs are scaled to fill most of the page.

### Show report title

Select this option to have a title display on your report. Accept the default or enter a new title.

Deselect this option to omit the report title.

*Range: 40 characters.*

### Show graphic

Refer to "Including a Graphic in the Report Header" in Chapter 3.

### 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 may 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

Allows you to 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

Allows you to have the X- and/or Y-axes scaled automatically. When scaled automatically, both axes begin at zero. The analysis program uses the highest values collected during analysis as the ending points.

### Tabular report

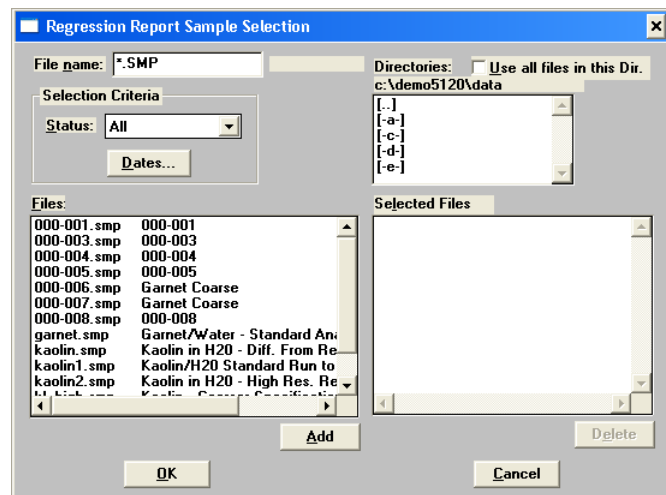
Allows you to generate tabular, as well as graphical, data of the included samples. A tabular report contains the numeric values contributed by each sample.

### 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, allowing you to choose the sample files you wish to have reported.



- Select **Use all files in this Dir.** to include all files from the selected directory in the Regression report.
- Select the file and click **Add** to move a file from the Files list to the Selected Files list. Alternatively, you can simply double-click on the desired file(s). You can select multiple files by holding down **Ctrl** while making your selections.
- You may choose up to 200 sample files.
- Use **Delete** to delete a selected file from the Selected Files list and move it back to the Files: list.
- Use the Status drop-down list and/or **Dates** to limit the files displayed in the Files: list.

A rectangular button with a thin border and a light gray background, containing the text "Save as Default".

Saves the current definition of the report as the default.

### **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 will lengthen the time required to generate the report.

### **Report Settings**

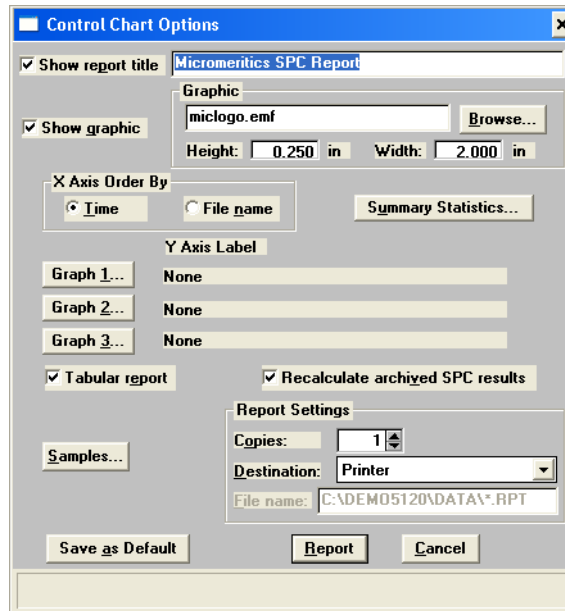
Refer to "Selecting the Report Destination" in Chapter 3.

A rectangular button with a thin border and a light gray background, containing the text "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 have a title display on your report. Accept the default or enter a new title.

Deselect this option to omit the report title.

*Range: 40 characters.*

### Show graphic

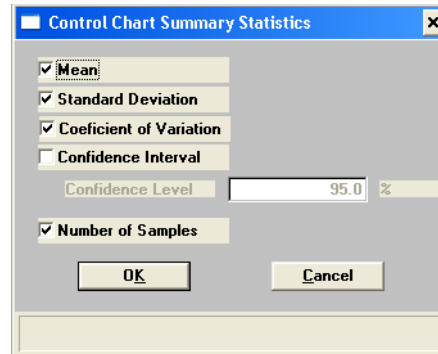
Refer to "Including a Graphic in the Report Header" in Chapter 3.

### X-axis Order By

Allows you to choose whether statistics are placed in order by file name or analysis time.

**Summary Statistics...**

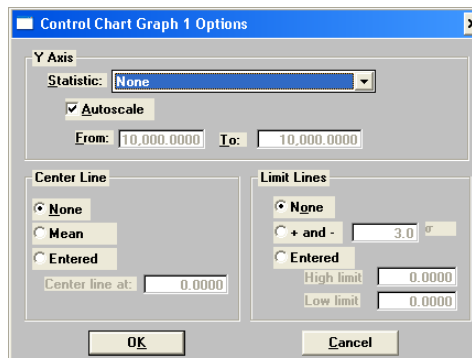
Allows you to select the statistics to display in the report.



- Check the statistics you want to display in the report. You may select:
  - *Mean*
  - *Standard Deviation*
  - *Coefficient of Variation* - the Standard Deviation divided by the Mean
  - *Confidence Interval* - the confidence interval of the mean value shown on the same line below the graph on the report.
- If you selected *Confidence Interval*, enter the percent in the **Confidence Level** field.
- If you wish to have the number of samples analyzed included in the report, check the **Number of Samples** box.
- Click **OK** to save your selections and close the dialog.

**Graph 1...**

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 time.

**Autoscale**

Allows you to have the Y-axis scaled automatically. If you wish to specify a range, deselect this option and enter ranges 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*).

If you select *Entered*, enter the *High* and *Low* limits.

**Tabular report**

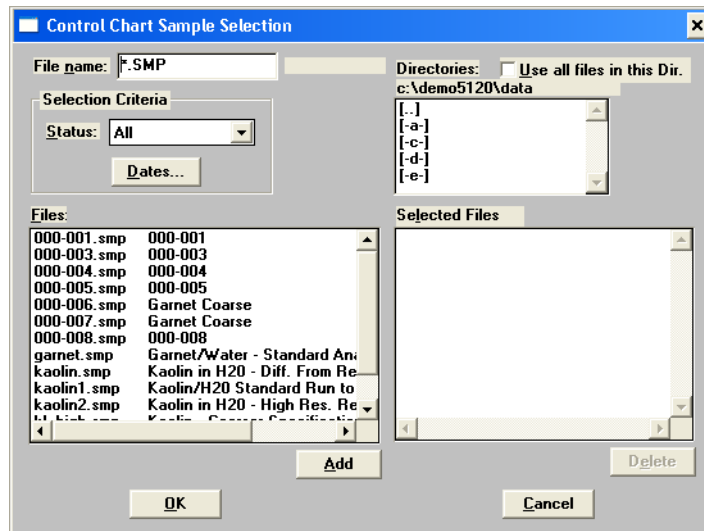
Allows you to generate tabular, as well as graphical, data of the included samples. A tabular report contains the numeric values contributed by each sample.

**Recalculate archived SPC results**

Select this option to have archived SPC values recomputed. 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, allowing you to choose the sample files on which you wish to report.



- Select **Use all files in this Dir.** to include all files from the selected directory in the Regression report.
- Select the file and click **Add** to move a file from the Files list to the Selected Files list. Alternatively, you can simply double-click on the desired file(s). You can select multiple files by holding down **Ctrl** while making your selections.
- You may choose up to 200 sample files.
- Use **Delete** to delete a selected file from the Selected Files list and move it back to the Files: list.
- Use the Status drop-down list and/or **Dates** to limit the files displayed in the Files: list.

**Save as Default**

Saves the current definition of the report as the default.

**Report Settings**

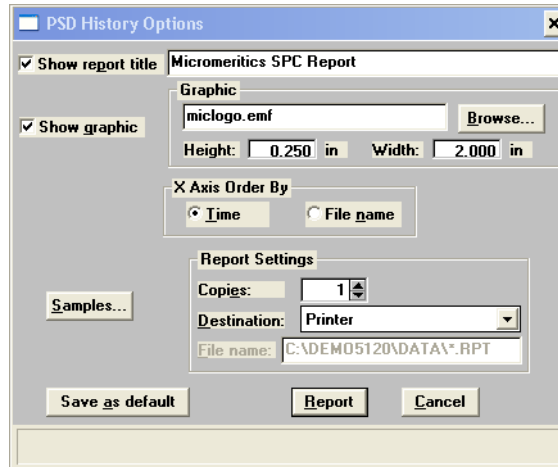
Refer to "Selecting the Report Destination" in Chapter 3.

**Report...**

Generates the report.

## PSD History

This option enables you to report a sequence of full particle size distribution graphs.



### Show report title

Select this option to have a title display on your report. Accept the default or enter a new title.

Deselect this option to omit the report title.

*Range: 40 characters.*

### Show graphic

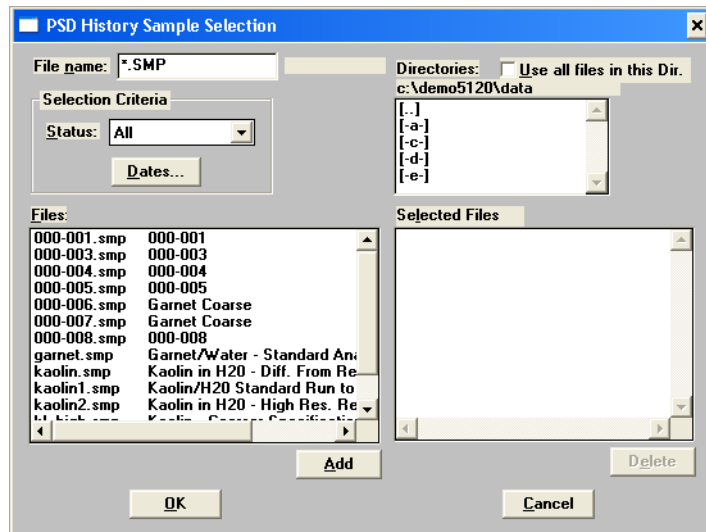
Refer to "Including a Graphic in the Report Header" in Chapter 3.

### X-axis Order By

Allows you to choose whether statistics are placed in order by file name or analysis time.

**S**amples...

Displays the PSD History Sample Selection dialog, allowing you to choose the sample files on which you wish to report.



- Select **Use all files in this Dir.** to include all files from the selected directory in the Regression report.
- Select the file and click **Add** to move a file from the Files list to the Selected Files list. Alternatively, you can simply double-click on the desired file(s). You can select multiple files by holding down **Ctrl** while making your selections.
- You may choose up to 200 sample files.
- Use **Delete** to delete a selected file from the Selected Files list and move it back to the Files: list.
- Use the Status drop-down list and/or **Dates** to limit the files displayed in the Files: list.

**S**ave as Default

Saves the current definition of the report as the default.

**R**eport Settings


Refer to "Selecting the Report Destination" in Chapter 3.

**R**eport...

Generates the report.

## Report Headers

All printed reports (either to the screen or to a printer) contain a header displaying file statistics, as shown in the following example.

 <b>Micromeritics Instrument Corporation</b>			
DEMO SediGraph III V1.00	Unit 2	Serial Number: 0003	Page 1
Sample: Calcium Carbonate Reference Material Operator: Submitter: File: C:\DEMO5120\DATA\CACO3.SMP Material/Liquid: CaCO3 / Water Measurement Principle: X-Ray monitored gravity sedimentation Calculation Method: Stokes sedimentation and Beer's law of extinction			
Test Number: 1	Analysis Type: High Speed		
Analyzed: 8/22/2003 4:54:07PM	Run Time: 0:31 hrs:min		
Reported: 10/31/2003 1:43:49PM	Sample Density: 2.730 g/cm <sup>3</sup>		
Liquid Visc: 0.7228 mPa-s	Liquid Density: 0.9941 g/cm <sup>3</sup>		
Analysis Temp: 35.0 °C	Base/Full Scale: 136 / 63 kCnts/s		
Full Scale Mass: 100.0 %	Reynolds Number: 0.22		

The report header may contain a graphic (such as company logo) and/or title if specified by the user. The header also contains:

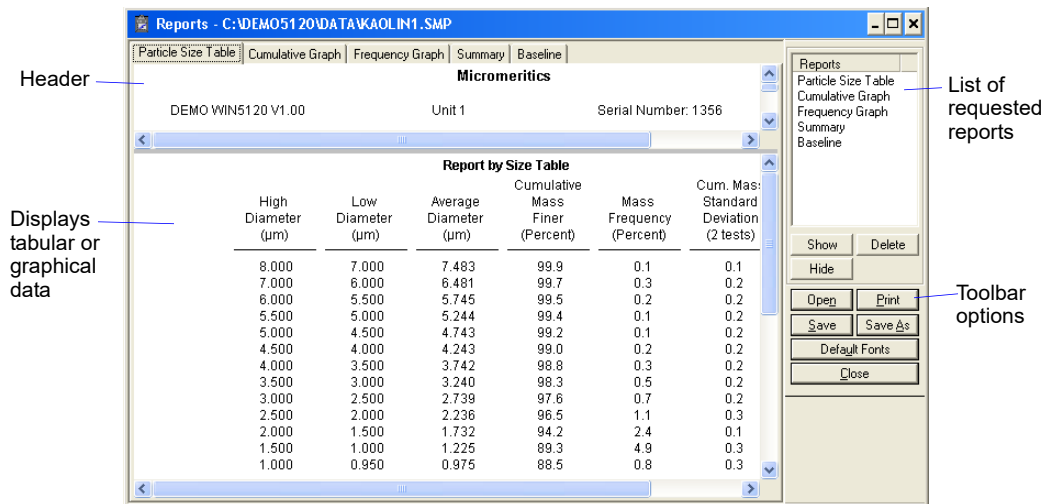
- The measurement principle and calculation method used in compiling the report.
- Sample and instrument statistics such as date and time of analysis, analysis conditions, and background data for tabular and graphical reports.
- Notes of any changes to the sample file which occur after analysis (excluded in summary reports).
- SPC and PSD report headers also display the range of dates of the selected samples in addition to the current date.

## Reports Displayed on the Screen

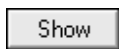
The window which displays reports provides many options for customizing and manipulating reports including:

- a tool bar
- pop-up menu options
- zoom feature
- axis cross hairs

When reports are printed to the screen, they are printed in a window like the one shown on the following page. Each requested report is listed in the Reports window above 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**.



### Tool Bar



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



Deletes the selected report. A deletion confirmation dialog is displayed since this function cannot be undone. The deleted report(s) will have to be regenerated if deleted in error.



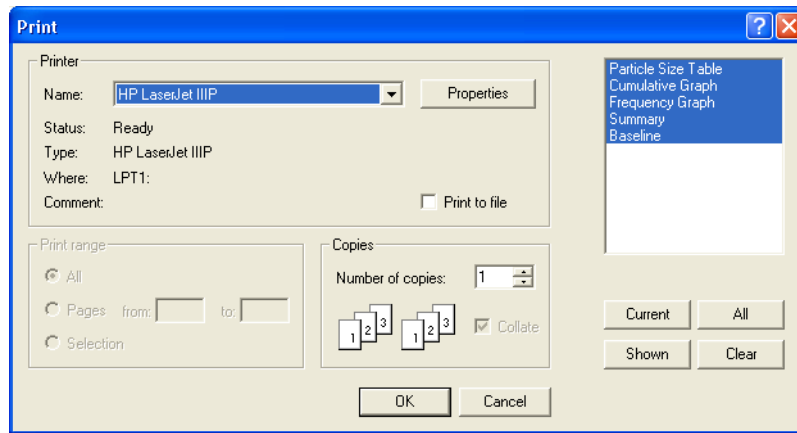
Hides (removes) the selected report from the report window. The report's associated tab is also removed.



Allows you to open a previously saved report file.



Displays a print dialog so that you can choose an appropriate 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 reports to print, the push buttons described below are provided beneath the report window. Or, you can make your selection by clicking on the desired reports.

Current

Selects the report displayed in the report window.

Shown

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

All

Selects 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

Allows you to save 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).

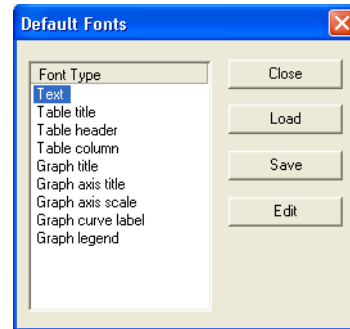
Reports can be saved in three different formats:

- *Report system (\*.rep)*: Saved in a format which allows you to reopen the file using the **Open** push button on the Report window tool bar.
- *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.



A rectangular button with a thin border and the text "Default Fonts" centered inside.

Displays the Default Fonts dialog so that you can edit report fonts.



The window on the left lists the items for which the font can be edited.

A rectangular button with a dashed border and the text "Edit..." centered inside.

Enables you to edit the font of a selected item; a font dialog is displayed so that you can specify the desired font and attributes.

A rectangular button with a thin border and the text "Save" centered inside.

Saves the changes as the default. If you do not click **Save**, the changes will apply to the current report set only. The next reports will revert to the default font.

A rectangular button with a thin border and the text "Load" centered inside.

Loads the default font of a selected item.

A rectangular button with a thin border and the text "Close" centered inside.

Closes the dialog.

## Pop-up Menus

---

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

### For Tabular Reports

---

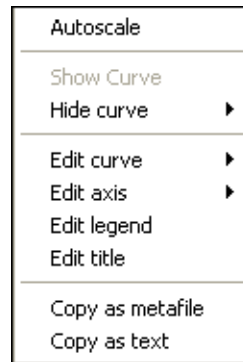


<b>Resize column</b>	Displays a dialog so that you can specify the width of the selected column (in inches).
<b>Rename column</b>	Displays a dialog so that you can edit the name of the selected column. Use <b>Ctrl + Enter</b> to insert line feeds.
<b>Move column</b>	Allows you to move the location of the selected column to the left or to the right.
<b>Align column</b>	Enables you to right-align, left-align, or center the data in the selected column.
<b>Hide column</b>	Displays a list of all columns, enabling you to select the one you wish to hide.
<b>Show column</b>	Displays a list of all hidden columns, enabling you to select the one you wish to have shown again.
<b>Column font</b>	Displays a Font dialog, allowing you to change font attributes for the tabular data in the current report.

<b>Header font</b>	Displays a Font dialog, allowing you to change font attributes for column headers in the current report.
<b>Edit title</b>	Allows you to edit the table title and font.
<b>Copy table as text</b>	Enables you to copy the entire table (column headers and data) and then insert it into another program. Columns are tab-delimited, allowing easy alignment.

**For Graphs**

---

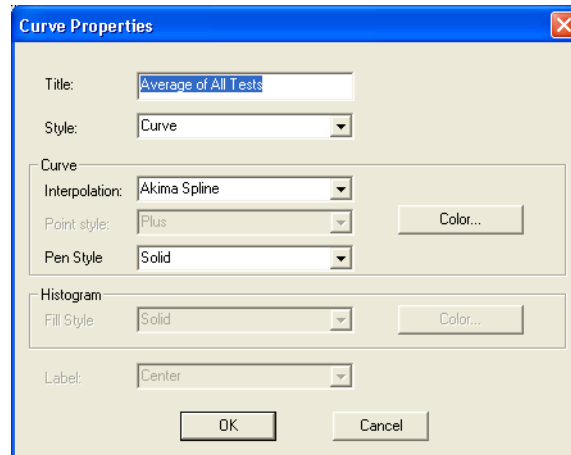


<b>Autoscale</b>	Autoscales all axes of the graph. This function is useful for returning to a full view after having zoomed in.
<b>Show curve</b>	Allows you to show curves that have been hidden. This option is disabled (greyed) if no curves have been hidden.
<b>Hide curve</b>	Allows you to hide (remove) unwanted curves.

**Edit curve**

Displays a submenu that enables you to select a curve to edit.

When you make a selection, the Curve Properties dialog is displayed, allowing 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.

**Curve group box**

Contains options for curves and points. You can edit the curve interpolation, the style of curve, and/or points, as well as the pen style and color. The options in this group box are disabled if *Histogram* is chosen in the **Style** drop-down list.

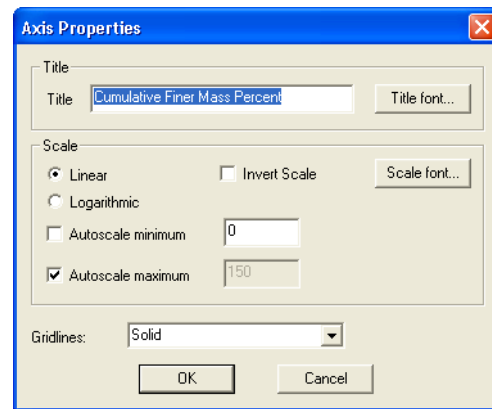
**Histogram group box**

Allows you to specify the type of fill as well as the color if *Histogram* is chosen as the style for collected data.

**Edit axis**

Displays a submenu that enables you to select an axis to edit.

When you make a selection, the Axis Properties dialog is displayed, allowing you to edit axis properties.

**Title Group Box**

Displays the title of the axis you are editing and enables you to change the title font if desired.

**Scale Group Box**

Enables you to:

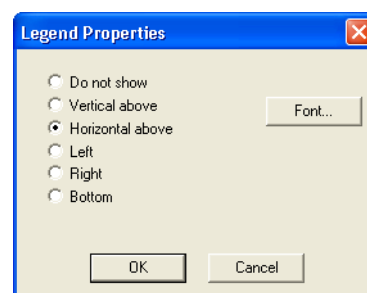
- select Linear or Logarithmic
- change the Autoscale minimum and maximum values
- choose to invert the scale if desired
- change the scale font

**Gridlines**

A drop-down list that enables you to select *None*, *Solid* or *Dotted* gridlines.

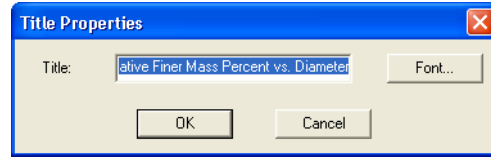
**Edit legend**

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

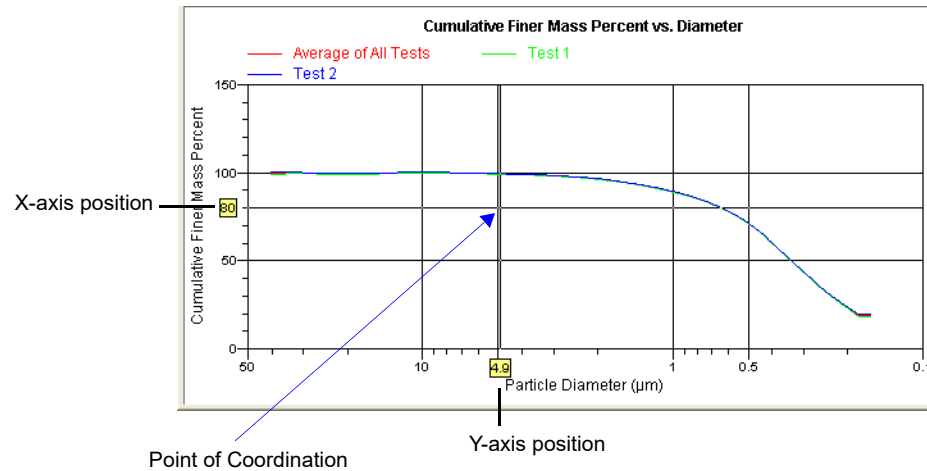
## Zoom Feature

---

A zoom feature is included with the report system so that you can zoom in to examine fine detail of the distribution. To use this feature, simply 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. You can return to the normal view by right-clicking on the graph and selecting **Autoscale**.

## 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.



You can remove cross-hair lines and return to the normal view by right-clicking on the graph and selecting **Autoscale** or clicking out of the graph area.

## Report Examples

This section contains examples of the types of reports available with the SediGraph 5120 analysis program.

# Combined Report



Micromeritics Instrument Corporation

DEMO SediGraph III V1.00

Unit 1

Serial Number: 0003

Page 1

Sample: Calcium Carbonate FPSRM  
 Operator: AWT  
 Submitter: Micromeritics  
 File: C:\5120\FPSRM.SMP  
 Material/Liquid: CaCO<sub>3</sub> / Water  
 Measurement Principle: X-Ray monitored gravity sedimentation  
 Calculation Method: Stokes sedimentation and Beer's law of extinction

Test Number: Average  
 Analyzed: 7/26/2003 4:29:40PM  
 Reported: 10/29/2003 3:45:33PM  
 Liquid Visc: 0.7228 mPa·s  
 Analysis Temp: 35.0 °C  
 Full Scale Mass: 100.0 %

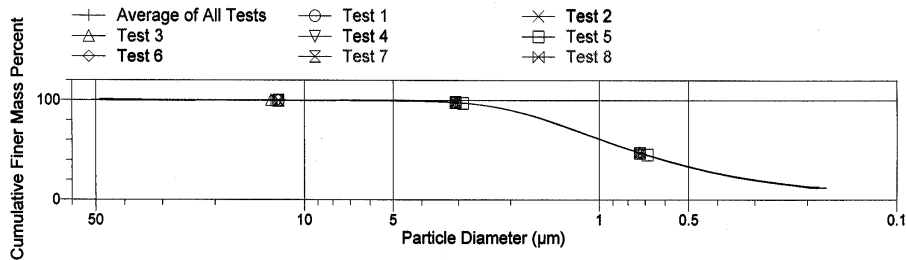
Analysis Type: High Speed  
 Run Time: 0:29 hrs:min  
 Sample Density: 2.730 g/cm<sup>3</sup>  
 Liquid Density: 0.9941 g/cm<sup>3</sup>  
 Base/Full Scale: 136 / 64 kCnts/s

**Combined Report**

**Report by Size Table**

Low Diameter (µm)	Cumulative Mass Finer (Percent)	Out of Spec (-%<, +%>)	Difference From Reference (% Finer)	Cum. Mass Standard Deviation (8 tests)
2.000	90.1	0.0	0.1	0.1
1.500	79.6	0.0	-0.3	0.2
1.250	71.4	0.0	-0.5	0.2
1.000	61.0	0.0	-0.5	0.2
0.800	51.1	0.0	-0.5	0.2
0.600	39.8	0.0	-0.4	0.2
0.500	33.4	0.0	-0.4	0.2
0.400	26.5	0.0	-0.5	0.2
0.300	19.8	0.0	-0.4	0.3
0.200	12.9	0.0	-0.5	0.4

**Cumulative Finer Mass Percent vs. Diameter**



**Summary Report**

Full scale pump speed: 3  
 Bubble detection: Fine  
 Starting Size: 50.00 µm  
 Ending Size: 0.18 µm


Stir time: 60 s  
 Stir speed: High  
 Probe time: 60 s

Parameter 1 0.000      Parameter 2 0.000      Parameter 3 0.000

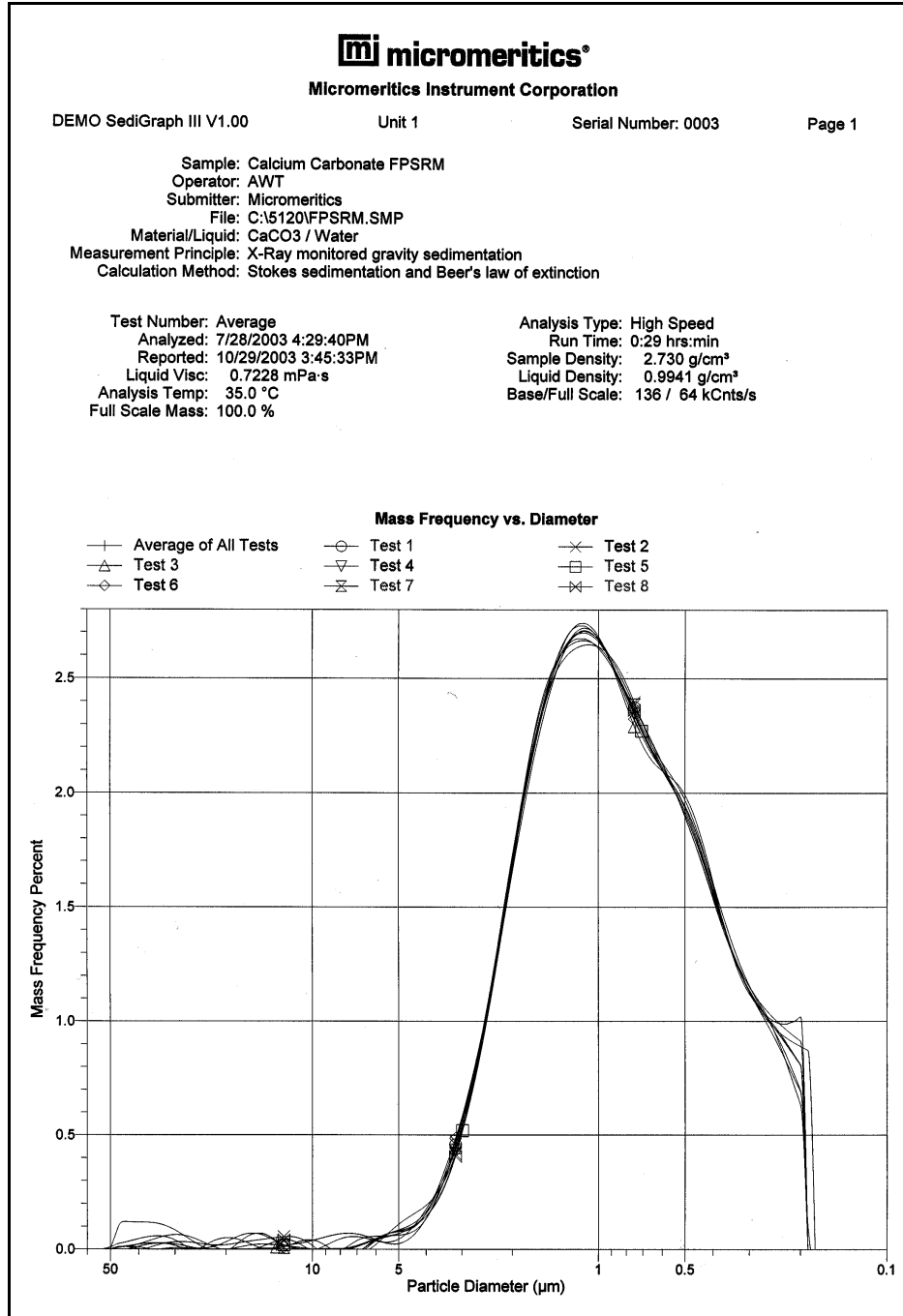
Reference: C:\DEMO5120\DATA\EXAMPLE\FPSRMCEN.SMP  
 Coarse Specification: C:\DEMO5120\DATA\EXAMPLE\FPSRMCRS.SMP  
 Fine Specification: C:\DEMO5120\DATA\EXAMPLE\FPSRMFIN.SMP



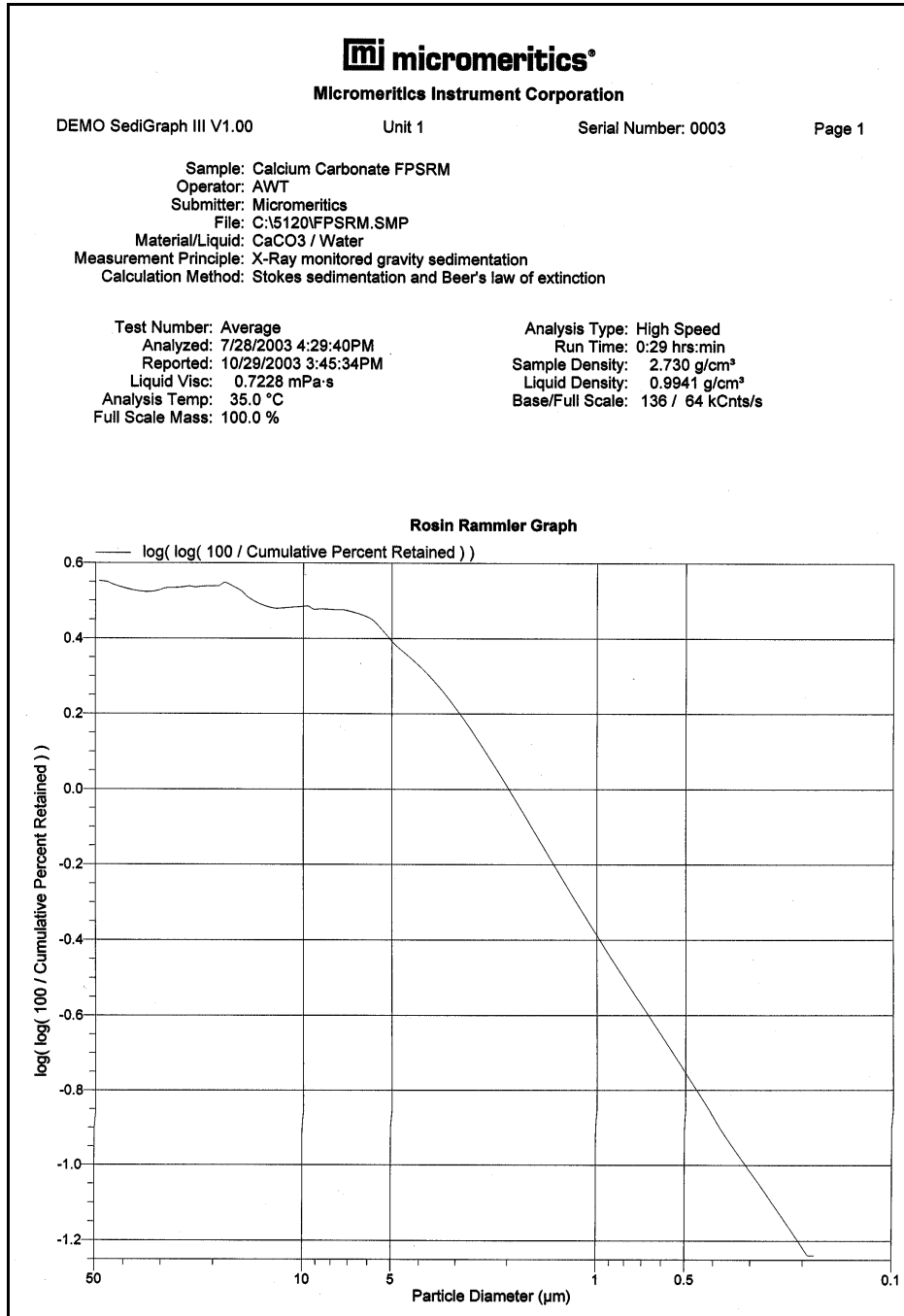
# Report by Size Class

 Micromeritics Instrument Corporation					
DEMO SediGraph III V1.00	Unit 1	Serial Number: 0003	Page 1		
Sample: Calcium Carbonate FPSRM Operator: AWT Submitter: Micromeritics File: C:\5120\FPSRM.SMP Material/Liquid: CaCO3 / Water Measurement Principle: X-Ray monitored gravity sedimentation Calculation Method: Stokes sedimentation and Beer's law of extinction					
Test Number: Average Analyzed: 7/28/2003 4:29:40PM Reported: 10/29/2003 3:45:33PM Liquid Visc: 0.7228 mPa·s Analysis Temp: 35.0 °C Full Scale Mass: 100.0 %		Analysis Type: High Speed Run Time: 0.29 hrs:min Sample Density: 2.730 g/cm³ Liquid Density: 0.9941 g/cm³ Base/Full Scale: 136 / 64 kCnts/s			
Report by Size Class					
High Diameter (µm)	Low Diameter (µm)	Average Diameter (µm)	Cumulative Mass Finer (Percent)	Mass Frequency (Percent)	Cum. Mass Standard Deviation (8 tests)
51.58	48.70	50.12	100.2	0.0	0.5
48.70	45.97	47.32	100.2	0.0	0.4
45.97	43.40	44.67	100.2	0.0	0.4
43.40	40.97	42.17	100.2	0.0	0.4
40.97	38.68	39.81	100.1	0.0	0.3
38.68	36.52	37.58	100.1	0.0	0.3
36.52	34.47	35.48	100.1	0.0	0.3
34.47	32.55	33.50	100.1	0.0	0.3
32.55	30.73	31.62	100.0	0.0	0.3
30.73	29.01	29.85	100.0	0.0	0.2
29.01	27.38	28.18	100.0	0.0	0.2
27.38	25.85	26.61	100.0	0.0	0.2
25.85	24.41	25.12	100.0	0.0	0.2
24.41	23.04	23.71	100.0	0.0	0.2
23.04	21.75	22.39	100.0	0.0	0.1
21.75	20.54	21.13	100.0	0.0	0.1
20.54	19.39	19.95	100.0	0.0	0.1
19.39	18.30	18.84	100.0	0.0	0.1
18.30	17.28	17.78	100.0	0.0	0.1
17.28	16.31	16.79	100.0	0.0	0.1
16.31	15.40	15.85	99.9	0.0	0.1
15.40	14.54	14.96	99.9	0.0	0.2
14.54	13.72	14.13	99.9	0.0	0.2
13.72	12.96	13.34	99.9	0.0	0.2
12.96	12.23	12.59	99.9	0.0	0.2
12.23	11.55	11.89	99.9	0.0	0.2
11.55	10.90	11.22	99.8	0.0	0.2
10.90	10.29	10.59	99.8	0.0	0.2
10.29	9.716	10.00	99.8	0.0	0.2
9.716	9.173	9.441	99.8	0.0	0.2
9.173	8.660	8.913	99.9	0.0	0.1
8.660	8.175	8.414	99.9	0.0	0.1
8.175	7.718	7.943	99.9	0.0	0.1
7.718	7.286	7.499	99.9	0.0	0.1
7.286	6.879	7.079	99.9	0.0	0.2
6.879	6.494	6.683	99.8	0.0	0.2
6.494	6.131	6.310	99.8	0.0	0.2
6.131	5.788	5.957	99.8	0.0	0.2
5.788	5.464	5.623	99.7	0.1	0.2


# Mass Frequency vs. Diameter Report



# Rosin Rammler Graph



# Summary Report



**Micromeritics Instrument Corporation**

DEMO SediGraph III V1.00      Unit 1      Serial Number: 0003      Page 1

Sample: Calcium Carbonate FPSRM  
 Operator: AWT  
 Submitter: Micromeritics  
 File: C:\5120\FPSRM.SMP  
 Material/Liquid: CaCO3 / Water  
 Measurement Principle: X-Ray monitored gravity sedimentation  
 Calculation Method: Stokes sedimentation and Beer's law of extinction

Test Number: Average      Analysis Type: High Speed  
 Analyzed: 7/28/2003 4:29:40PM      Run Time: 0:29 hrs:min  
 Reported: 10/29/2003 3:45:34PM      Sample Density: 2.730 g/cm<sup>3</sup>  
 Liquid Visc: 0.7228 mPa·s      Liquid Density: 0.9941 g/cm<sup>3</sup>  
 Analysis Temp: 35.0 °C      Base/Full Scale: 136 / 64 kCnts/s  
 Full Scale Mass: 100.0 %

**Summary Report**

Full scale pump speed: 3      Stir time: 60 s  
 Bubble detection: Fine      Stir speed: High  
 Starting Size: 50.00 µm      Probe time: 60 s  
 Ending Size: 0.18 µm

Parameter 1 0.000      Parameter 2 0.000      Parameter 3 0.000

**Mass Distribution Arithmetic Statistics**

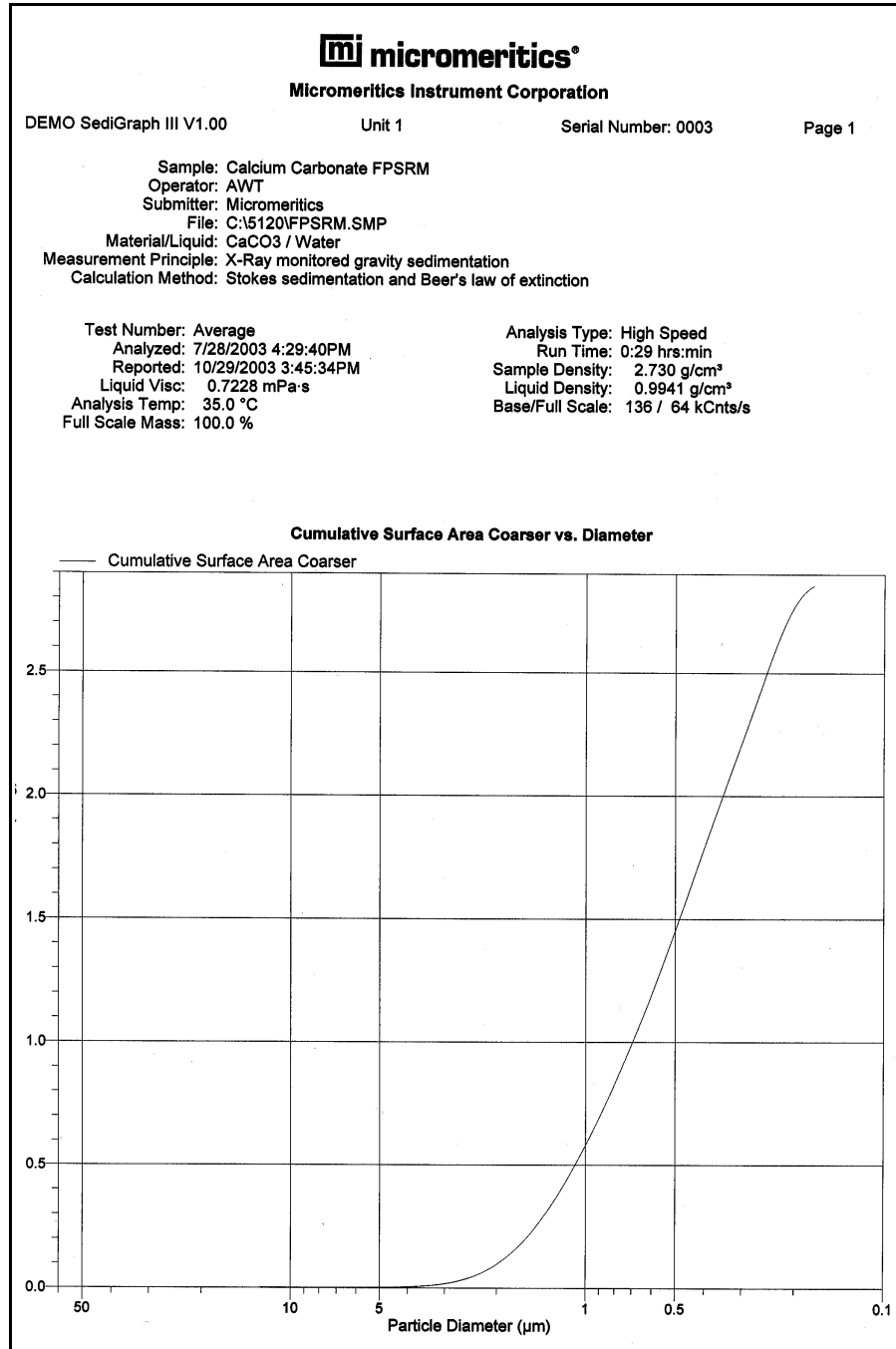
Mode	1.114	Std Dev of 8 0.022	Median	0.779	Std Dev of 8 0.003
------	-------	-----------------------	--------	-------	-----------------------

**Peaks**

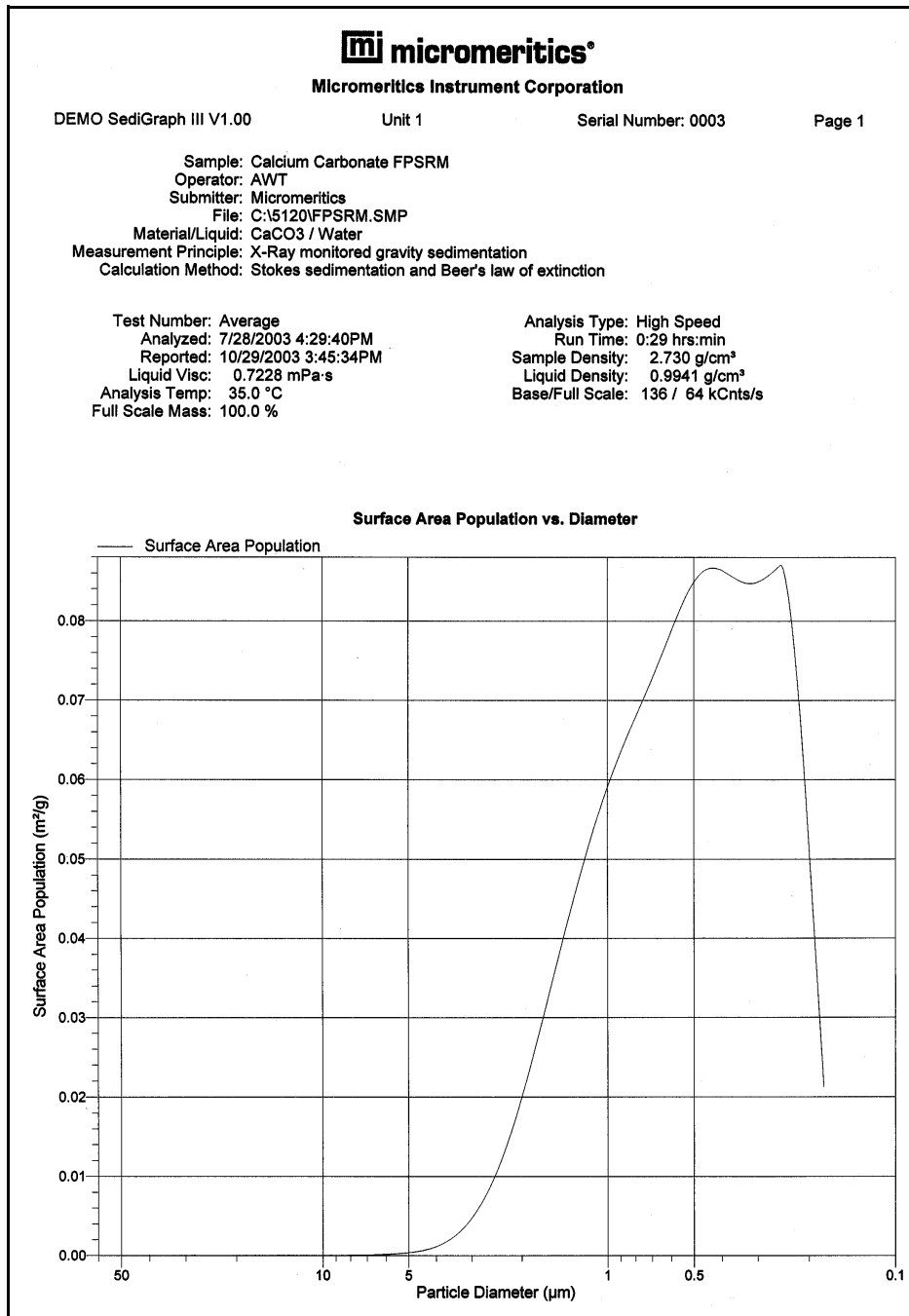
Peak Number	Percent of Dist.*	Mean	Mean Std Dev of 8	Median	Standard Deviation	Skewness	Kurtosis
1	87.0	1.088	0.012	0.901	0.766	1.715	4.841

\* Peaks must comprise at least 5.00 % of the distribution.

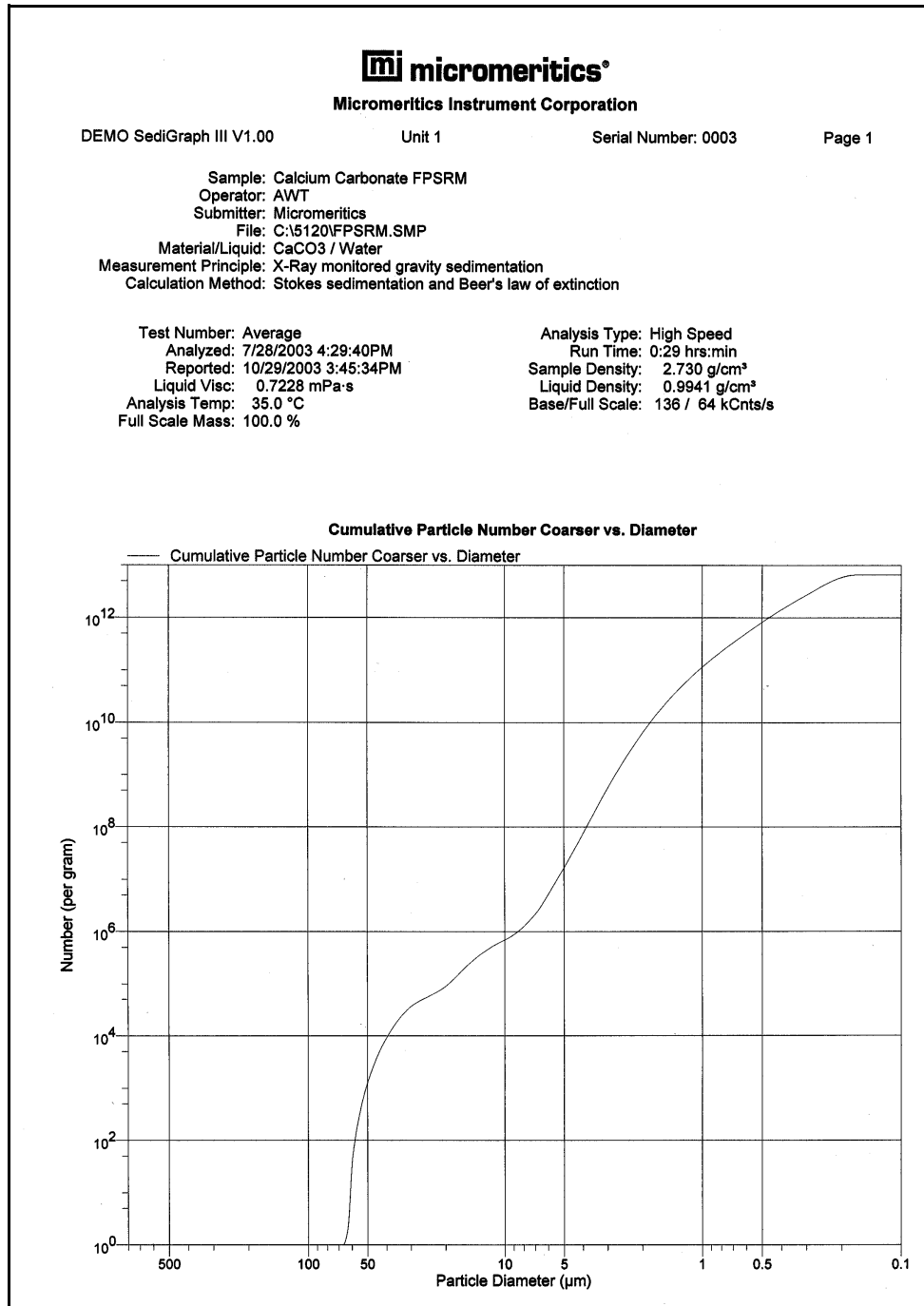
# Cumulative Surface Area Coarser vs. Diameter



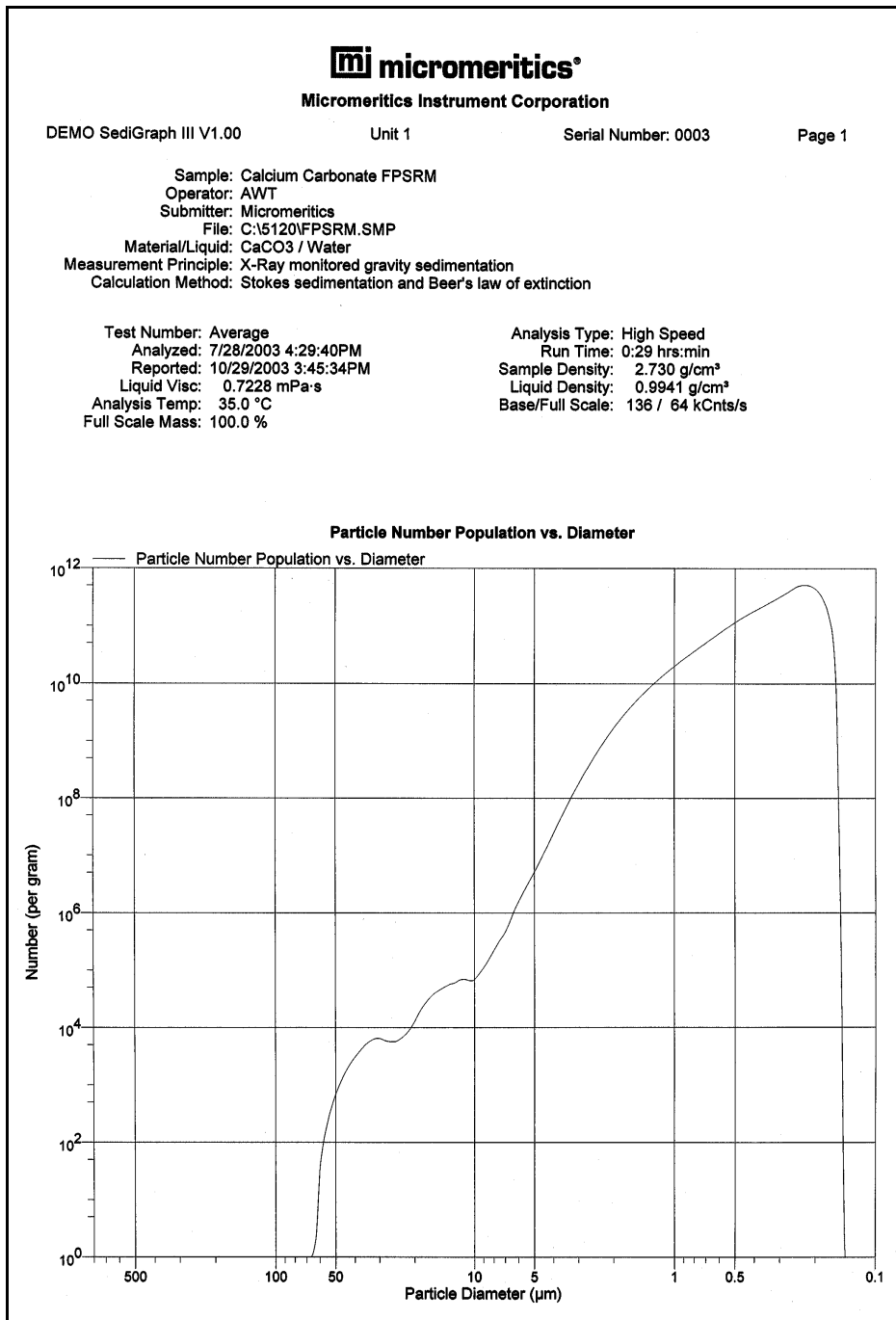
# Surface Area Population vs. Diameter



# Cumulative Particle Number Coarser vs. Diameter



# Particle Number Population vs. Diameter





# Log Probability



Micromeritics Instrument Corporation

DEMO SediGraph III V1.00

Unit 1

Serial Number: 0003

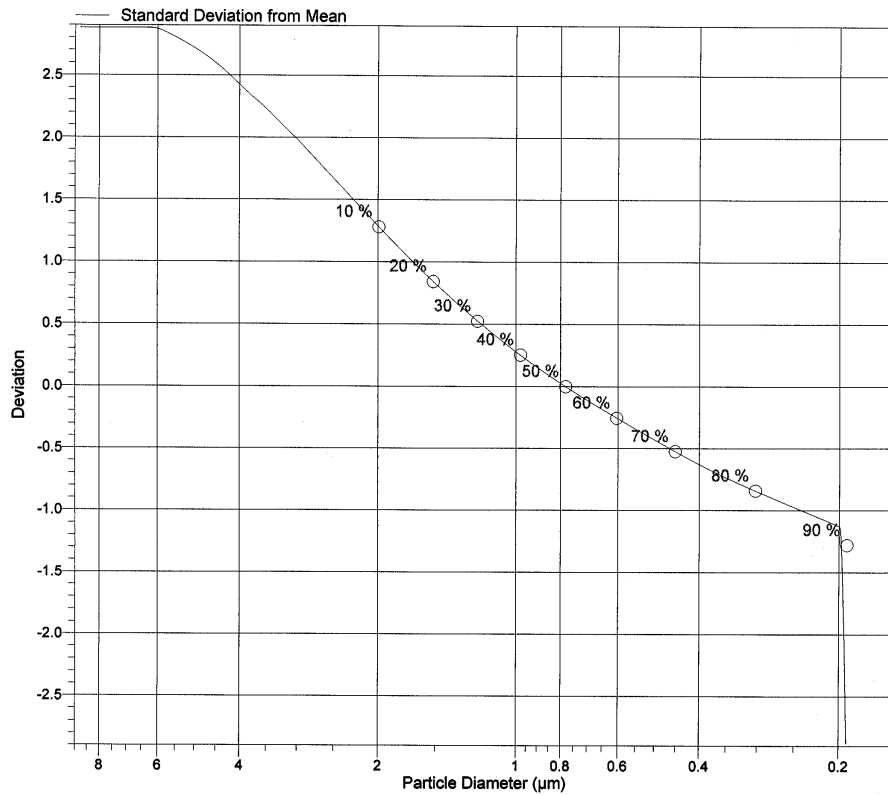
Page 1

Sample: Calcium Carbonate FPSRM  
Operator: AWT  
Submitter: Micromeritics  
File: C:\5120\FPSRM.SMP  
Material/Liquid: CaCO<sub>3</sub> / Water  
Measurement Principle: X-Ray monitored gravity sedimentation  
Calculation Method: Stokes sedimentation and Beer's law of extinction

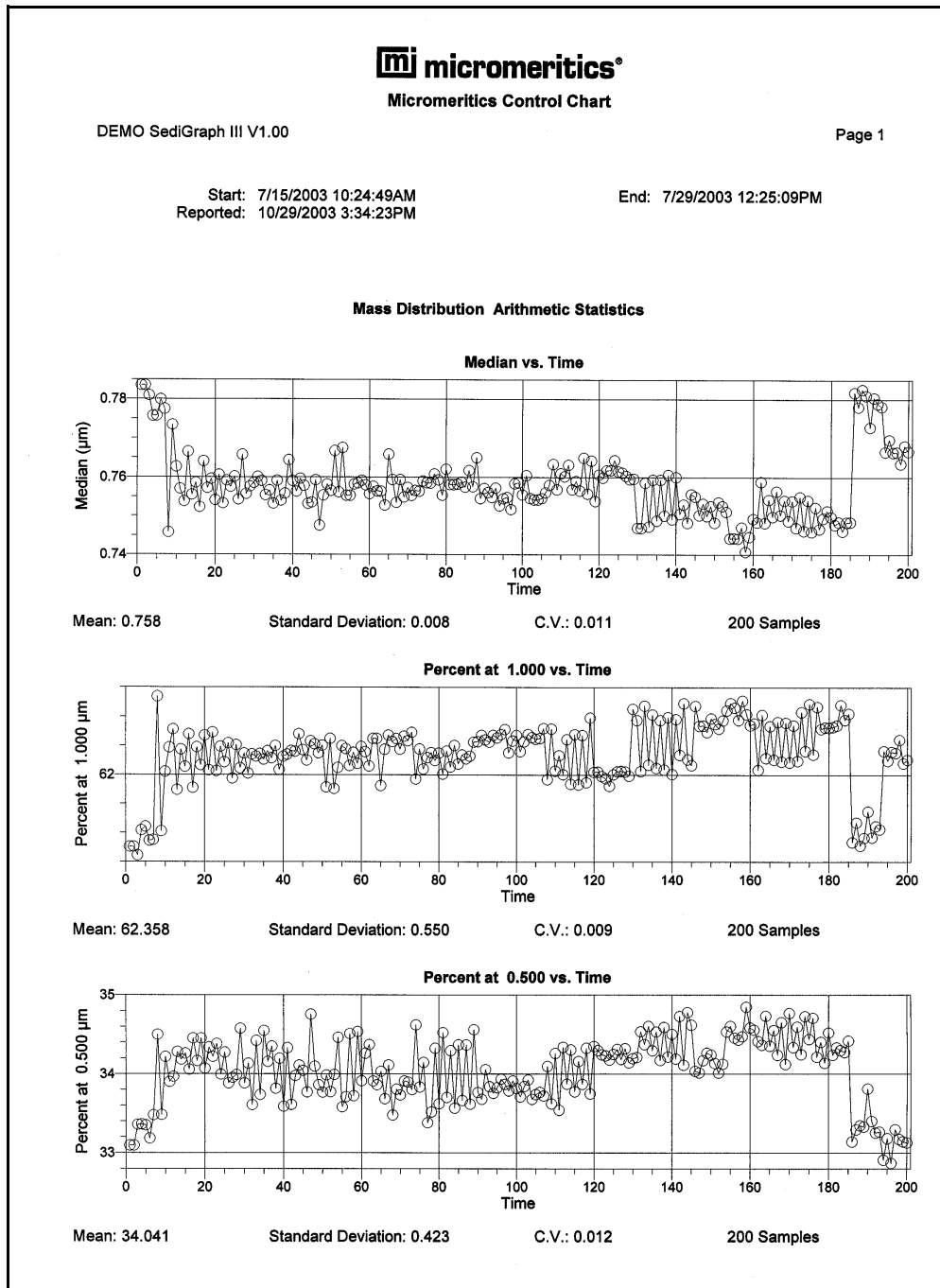
Test Number: Average  
Analyzed: 7/28/2003 4:29:40PM  
Reported: 10/29/2003 3:45:34PM  
Liquid Visc: 0.7228 mPa·s  
Analysis Temp: 35.0 °C  
Full Scale Mass: 100.0 %

Analysis Type: High Speed  
Run Time: 0:29 hrs:min  
Sample Density: 2.730 g/cm<sup>3</sup>  
Liquid Density: 0.9941 g/cm<sup>3</sup>  
Base/Full Scale: 136 / 64 kCnts/s

Log Probability



# Control Chart Report



## 8 OPTIONS MENU

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## Overview

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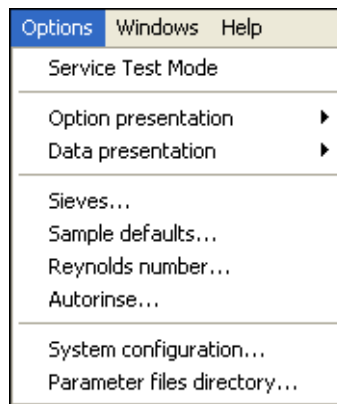
The Options menu contains options which allow you to configure the system to your laboratory's requirements. With the options on this menu, you can:

- Switch between basic and advanced mode
- Edit program defaults
- Specify data presentation modes
- Specify printer/plotter options
- Specify a directory for predefined parameter files

---

## Description

---



Listed below are brief descriptions of the Options menu selections. Detailed descriptions are found later in this chapter.

### **Service Test Mode**

Enables Service Test Mode, which is used for troubleshooting and maintaining the analyzer.

### **Option Presentation**

Allows you to display the sample file dialog in the Basic, Advanced, or Restricted format.

### **Data Presentation**

Allows you to choose the way in which data are presented on the screen and in printed reports.

### **Sieves**

Allows you to specify the sieve sizes you wish to use when sieve data are generated.

---

<b>Sample defaults</b>	Allows you to specify the parameters you wish to use when creating a sample file.
<b>Reynolds number</b>	Allows you to specify the Reynolds number you wish to use in computing the maximum measurable diameter.
<b>Autorinse</b>	Allows you to specify autorinse options.
<b>System configuration</b>	Allows you to specify the printer and/or plotter you wish to have reports sent to.
<b>Parameter files directory</b>	Allows you to specify a location for predefined parameter files when using the Basic mode.

---

## Service Test Mode

---

Certain service tests are included in the operating program, but can be performed only with the assistance of a trained Micromeritics service representative. These tests are designed to provide your service representative with instrument readouts, as well as to assist him in troubleshooting potential problems and, perhaps, eliminating unnecessary repair services. This service strategy allows you to conduct expert tests in less time than it would take to be trained in servicing the instrument properly.

When you select **Service Test Mode** from the Options menu, a dialog box is displayed prompting you to enter a password. This password is coded to change on a regular basis and, therefore, is known only by your service representative. You will not be able to enter Service Test Mode and perform these tests without his guidance.

---

## Option Presentation

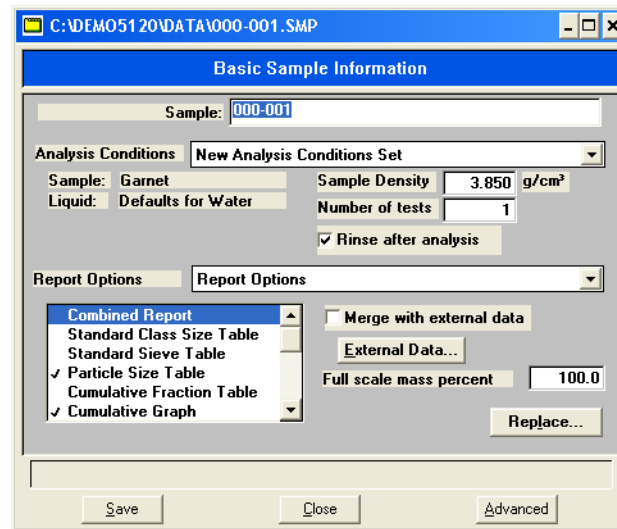
---

The sample editing dialogs for the SediGraph 5120 analysis program may be presented in one of three formats: Restricted, Basic, and Advanced. Each format displays sample information and menu options differently.

- **Basic:** displays all parts of the sample file as a single dialog. This format is used to create sample files quickly by choosing from predefined parameter files. You can also switch to the Advanced format for editing parameters if desired.
- **Restricted:** displays in the same manner as the Basic format. Certain menu options, however, become disabled and you cannot switch to the Advanced mode. You must also enter a password to enter and exit this mode.
- **Advanced:** displays all parts of the sample information file in a tabbed dialog as in an index card file. You just click on the tab of the parameter you wish to edit. This format is used for customizing sample files.

## Basic

The Basic format presents the sample information file and its parameter files as a single dialog. You also have access to all menu options. For example, if you have Basic chosen as the presentation and open or create a sample information file, the dialog box is displayed in this manner.



The Basic format is used to create quickly sample information files using previously defined analysis conditions and report options. You also can easily switch to Advanced format, if needed, by clicking **Advanced**.

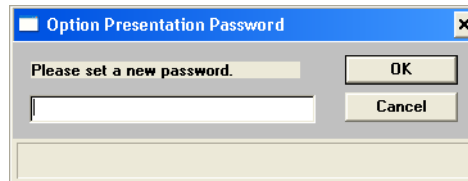


## Restricted

---

The Restricted format is identical to the Basic format, except that certain menu options are disabled. You also cannot switch to the Advanced format. This format is password-protected and is typically used in laboratories where analysis conditions must remain constant, for example, in the pharmaceutical industry.

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, however, must be used to exit the Restricted format. For example, if you enter “password” to enable the Restricted format, then you must enter “password” to exit the Restricted format and before you can enable the Basic or Advanced format.

If you forget the password, open the system 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 INI file, and enter the password where requested. Do not attempt to delete the password in the INI file.

## Advanced

The Advanced format presents all parts of the sample information file in a tabbed dialog. Each tab opens its associated dialog. For example, if you have Advanced chosen as the presentation and you open or create a sample information file, the following dialog box is displayed.

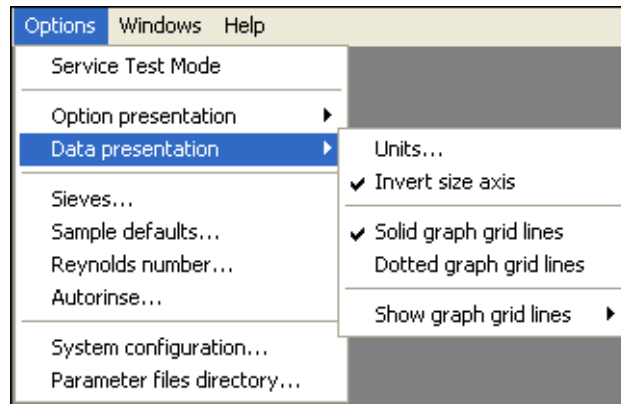
The screenshot shows a Windows-style dialog box titled "C:\DEMO5120\DATA\000-059.SMP". It features a tabbed interface with the following tabs: "Sample Information", "Material Properties", "Analysis Options", "Report Options", and "Collected Data". The "Sample Information" tab is active, displaying the following fields and controls:

- Sample:** Garnet and Water
- Operator:** dfk
- Submitter:** dfk
- Type of Data:**  Automatically collected,  Manually entered
- User Parameters:** Parameter 1 (0.000), Parameter 2 (0.000), Parameter 3 (0.000)
- Comments:** A large text area for notes.
- Buttons:** "Add Log Entry", "Replace All...", "Save", "Close", and "Basic".

The Advanced format can be used to edit sample parameters and customize files. This format typically is used by the more experienced operators.

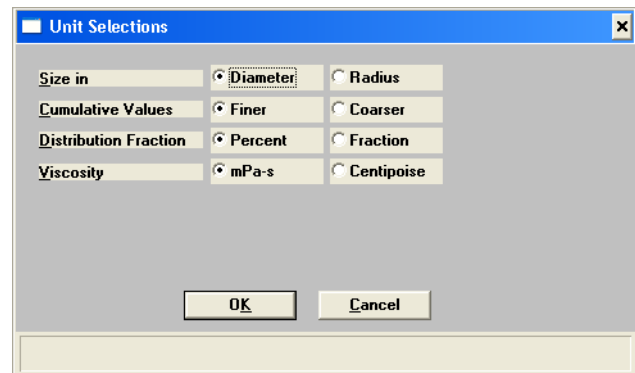
## Data Presentation

The options on the Data presentation drop-down menu allow you to specify how you wish tabular and graphical data to display on the screen and in printed reports.



### Units

Allows you to choose how data are to display on the screen and in printed reports. When you select this option, the Units Selection dialog is displayed.



### Invert Size Axis

Enables you to invert the size axis if desired.

### Solid graph gridlines Dotted graph gridlines

Allows you to choose graph options.

### Show graph gridlines

Allows you to specify whether or not you wish to have grid lines display on graphs and, if so, what type.

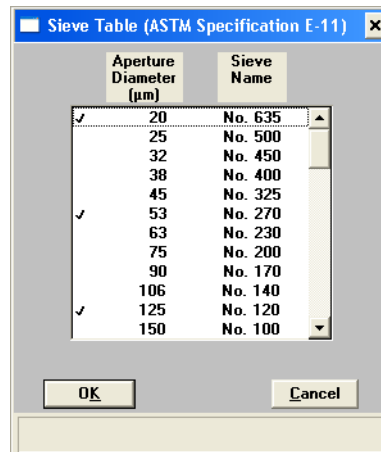
*Choices: None, Horizontal, Vertical, Both*

---

## Sieves

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Sieves allows you to specify the default sieve sizes you wish to use when sieve data are presented; the Sieve Table dialog box is displayed.



To select sizes, move to the desired size, then double-click the left mouse button or press **Spacebar**. A sieve size is selected when it is preceded by a check mark.

---

## Sample Defaults

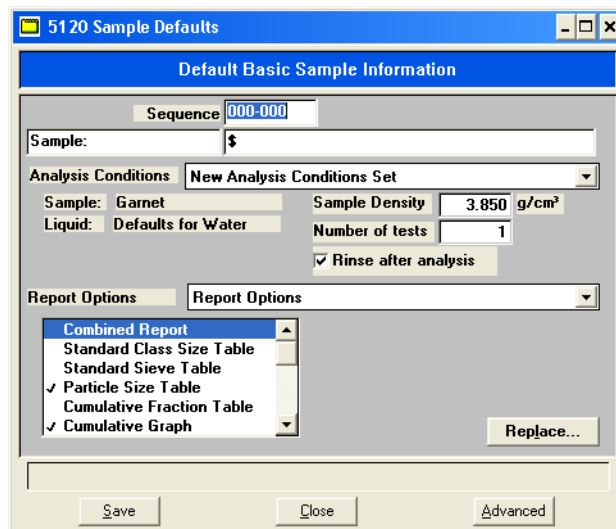
---

This option allows you to specify default parameters for sample information files. This option is presented in two formats: Basic and Advanced.

### Basic

---

When you select **Sample defaults** while in the Basic format, the Default Basic Sample Information dialog is displayed.



#### Sequence

Allows you to specify a default sequence for the sample file name. The number you specify is incrementally sequenced 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.

## Sample

Allows you to enter an additional identification that provides more information than the sample file name alone.

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

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

- Use numbers, letters, or other printable characters, such as dashes.
- Maximum number of characters is 42, plus the \$ symbol.
- 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 identification as follows:

**Lab #25 - \$**

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

**Lab #25 - 000-001**

The identification for the second would be:

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

## Analysis Conditions

Drop-down list containing the analysis conditions files included with the software, as well as any you may have created on your own. Choose the file you wish to have as the default.

Certain values in the file are displayed below the analysis conditions file name.

You may change the density and number of tests to be performed if desired.

You can also select or deselect to have a rinse performed after each analysis.

**Report Options**

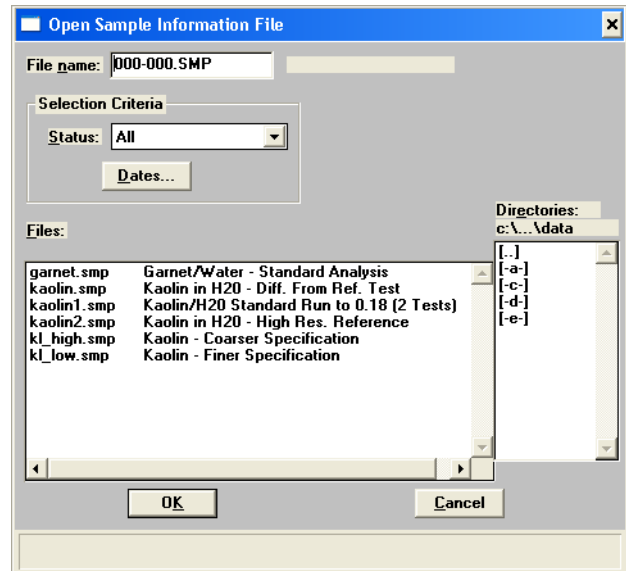
Drop-down list containing the report options files included with the software, as well as any you may have created on your own. Choose the file you wish to have as the default.

**Report Options List Box**

Contains the reports available for the report options file you select as a default. Select the reports you wish to have included in generated reports as the defaults.

**Replace...**

Enables you to replace the values in the default sample file with values in another sample information file. When you select **Replace**, the Open Sample Information File dialog is displayed.



Select a file, then click **OK**.

The values in the selected file are displayed in the Default Basic Sample Information dialog. You can change them if desired.

## Advanced

When you select Sample defaults while in the Advanced format, the 5120 Sample Defaults dialog box is displayed.

The screenshot shows the '5120 Sample Defaults' dialog box. It features a title bar with standard window controls. Below the title bar are navigation buttons: '<< Prev', 'Sample Information', 'Material Properties', 'Analysis Options', 'Report Options', and 'Next >>'. The 'Sample Information' tab is selected. The main area contains several input fields: 'Sequence Number' (000-000), 'Sample' (\$), 'Operator', and 'Submitter'. Each of these fields has an 'Omit' checkbox to its right. Below these is a 'User Parameters' section with three rows: 'Parameter 1' (0.000), 'Parameter 2' (0.000), and 'Parameter 3' (0.000), each with an 'Omit' checkbox. A 'Comments' text area is located below the user parameters, with a 'Replace All...' button to its right. At the bottom of the dialog are three buttons: 'Save', 'Close', and 'Basic'.

### Sequence

Allows you to specify a default sequence for the sample file name. The number you specify is incrementally sequenced 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.



**Sample**

Allows you to enter an additional identification that provides more information than the sample file name alone.

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

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

- Use numbers, letters, or other printable characters, such as dashes.
- Maximum number of characters is 42, plus the \$ symbol.
- 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 identification as follows:

**Lab #25 - \$**

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

**Lab #25 - 000-001**

The identification for the second would be:

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

**Operator  
Submitter**

These fields contain the name (or other identification) of the operator and submitter.

In the fields on the left, you can change the names of these prompts if you wish.

In the fields on the right, enter the operator and submitter names you wish to use as the defaults.

- Include the automatically generated file name as part of the identification by using the symbol \$ where you want the sequence number to appear. Refer to the example in the previous section.

- Maximum number of characters for the prompt is 20.
- Maximum number of characters for the identification is 42, including the \$ symbol.
- Omit this item entirely from the sample information file by selecting **Omit**.

### User Parameters Group Box

The fields in this group box are used specifically for SPC (Statistical Process Control) reporting. They are used to specify characteristics of either the sample or its manufacturing process.

For example, you may wish to report the relationship of the motor speed of a grinder used in the manufacturing process to the median diameter of the sample. In the parameter field on the left, enter Motor speed. In the field on the right, enter a default value (this value may be edited if desired in the sample information file). Once specified, these parameters display in the SPC Sample Options dialog (accessed through the SPC Calculations dialog box).

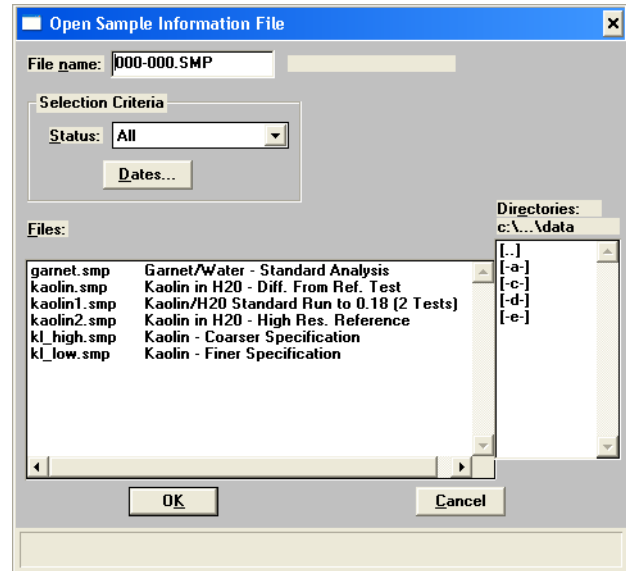
Omit this item entirely from the sample information file by selecting **Omit**.

### Comments

Enables you to enter comments to be stored in the sample information file if desired.

**Replace All...**

Enables you to replace the values in the default sample file with values in another sample information file. When you select **Replace All**, the Open Sample Information File dialog is displayed.



Select the file you wish to copy from the **Files:** list; then click **OK**.

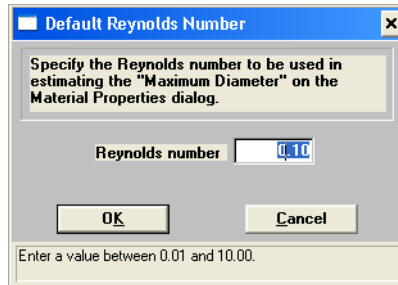
The values in the selected file are displayed in the Sample Defaults dialog. You can change them if desired.

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## Reynolds Number

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This option allows you to specify the Reynolds number which is to be used in estimating the maximum measurable diameter displayed on the Material Properties dialog box. When you select this option, the Default Reynolds Number dialog is displayed.



**Reynolds number**

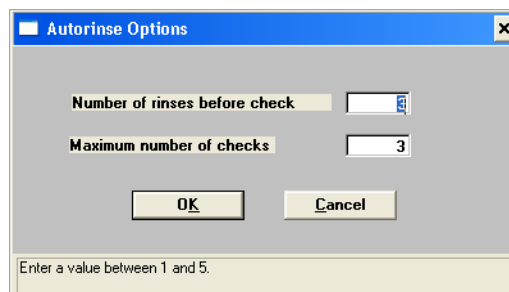
Enter the number you wish to use.

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## Autorinse

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This option allows you to specify autorinse options. The system default for Autorinse is 3 cycles of 3 rinses per cycle; a total of 9 rinses. This means the SediGraph will rinse a maximum of 9 times in an attempt to reestablish baseline conditions before displaying an error message. When you select this option, the Autorinse Options dialog is displayed.



**Number of rinses before check**

Enter the number of rinses per cycle you wish performed after each analysis before baseline conditions are checked.

**Maximum number of checks**

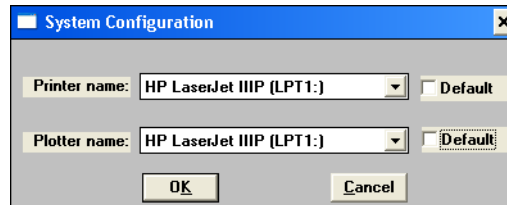
Enter the maximum number of baseline checks you wish performed before you are notified that baseline conditions have not been met.

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## System Configuration

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This option allows you to specify printer and plotter destinations for report output; the System Configuration dialog box is displayed.



**Printer name**  
**Plotter name**

The printer and plotter names are shown exactly as they appear in the Operating System Print Manager.

Select **Default** if you wish to use the default printer and plotter as designated in the Print Manager.

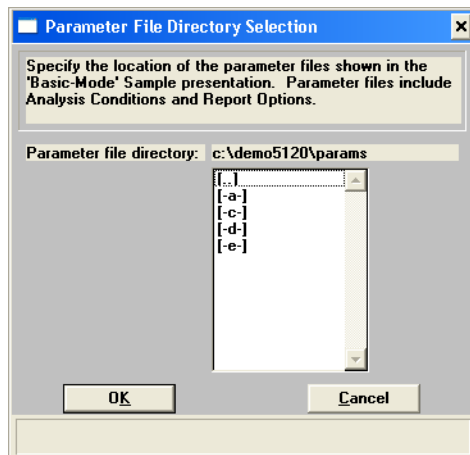
If you wish to change the default printer, deselect **Default**. Then choose another printer (or plotter) from the drop-down list of installed printers (plotters).

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## Parameter Files Directory

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This option allows you to select the location for the pre-defined Analysis conditions and Report options files displayed in the drop-down lists on the Basic Sample Information dialog box. The current directory specified for parameter files is displayed above the directory window.



The default directory is Params 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 Params directory for parameter files, be sure to save any files you create to this directory; otherwise they will not be included in the lists.

## 9 TROUBLESHOOTING AND MAINTENANCE

Overview	9-3
Troubleshooting	9-3
Preventive Maintenance	9-7
Routine Maintenance	9-22





## Overview

The SediGraph 5120 Particle Size Analysis System has been designed to provide efficient and continuous service. However, in order to get the best results over the longest period of time, certain maintenance and service procedures must be followed. Additionally, when common operational problems occur, the appropriate corrective action must be taken. This chapter contains information regarding common operational problems and corrective action, along with maintenance and service procedures.

## Troubleshooting

Most operational problems are caused by deteriorated or blocked tubing, air leaks, or an unlevel analyzer. Always check these things first when expected analysis results are not obtained. Some common operational problems that are not indicated on the computer screen and their respective solutions are provided in the following table. Operational problems that are indicated on the computer screen and their respective solutions are provided in **Appendix A, Error Messages**.

What Happened	Why	What To Do
————— SEDIGRAPH 5120 —————		
Cell cannot be filled or drained.	Blocked or damaged tubing.	Locate and replace blocked or damaged tubing. Refer to <a href="#">“Replacing Flexible Tubing” on page 9-13</a> .
	Blocked cell input or output port.	Clean analysis cell. Refer to <a href="#">“Cleaning the Analysis Cell” on page 9-10</a> .
	Valve or pump not working properly.	From Manual Control screen, check pump and valve operation. If either is not working properly, contact authorized service personnel.
	Tubing improperly installed.	Install the tubing as described under <a href="#">“Replacing Flexible Tubing” on page 9-13</a> .
Cell cannot be raised or lowered	Elevator which moves cell stuck in up position, down position, or somewhere in between.	Check flexible tubing for possible obstruction to elevator movement. If necessary, reposition tubing. Also check for any other obstruction to elevator movement.

What Happened	Why	What To Do
Mixing chamber cannot be filled or drained.	Blocked or damaged tubing.	Locate and replace blocked or damaged tubing. Refer to <a href="#">“Replacing Flexible Tubing” on page 9-13.</a>
	Blocked mixing chamber input or output port.	Clean mixing chamber. Refer to <a href="#">“Cleaning the Mixing Chamber and Bezel” on page 9-8.</a>
	Valve or pump not working properly.	From Manual Control screen, check pump and valve operation. If either is not working properly, contact authorized service personnel.
	Tubing improperly installed.	Install the tubing as described under <a href="#">“Replacing Flexible Tubing” on page 9-13.</a>
Mixing chamber suspension is turning brown	Teflon <sup>®</sup> coating on stirring bar is worn.	Replace stirring bar. Refer to <b>Chapter 10, Ordering Information</b> for the part number.
X-RAY ON indicator on, but 0 kilocounts shown on computer display.	Analysis compartment door not completely closed.	Close analysis compartment door.
	Cell is in a position which blocks beam.	Move cell to proper operating position. Enable Manual Control, access the pop-up menu on the cell, and select <i>Move Cell Position</i> .
	Cell is clogged.	Remove and clean cell. Refer to <a href="#">“Cleaning the Analysis Cell” on page 9-10.</a>
	Slits in collimator blocked.	Clean the collimator. Refer to <a href="#">“Cleaning the Collimating Slits” on page 9-21.</a>
	X-ray source or detector has failed.	Contact authorized service personnel.

What Happened	Why	What To Do
<p>X-RAY STANDBY indicator was turned on, but when keyswitch is placed in X-RAY ON position, X-RAY ON indicator does not turn on.</p>	<p>Keyswitch is between positions.</p>	<p>Move keyswitch to X-RAY STANDBY position and then back to X-RAY ON position while observing indicator.</p>
	<p>X-RAY ON indicator lamp is burned out.</p>	<p>Replace lamp. Refer to <a href="#">“Replacing the X-Ray Indicator Lamps”</a> on page 9-22.</p>
	<p>X-ray filament supply not available or X-ray unit damaged.</p>	<p>Contact authorized service personnel in accordance with service contract.</p>
	<p>Rear panel is off, the top cover is off, or the fluid module is not fully installed.</p>	<p>Replace all panels.</p>
<p>Bubble elimination problem</p>	<p>First refer to <a href="#">“Determining the Cause of Bubbles”</a> on page 9-25 and perform the outlined procedure. Then return to this table for corrective action.</p>	
	<p>Windows are dirty or misaligned.</p>	<p>Clean or replace the windows. Refer to <a href="#">“Cleaning the Analysis Cell”</a> on page 9-10.</p>
	<p>Inlet port on the cell assembly is loose.</p>	<p>Replace the cell assembly Refer to <a href="#">“Replacing the Analysis Cell Assembly”</a> on page 9-24.</p>
	<p>A valve has failed.</p>	<p>Contact authorized service personnel.</p>

What Happened	Why	What To Do
<b>MASTERTECH</b>		
Power failure.	Power cable not connected or switch not in ON position.	Make sure power cable is plugged into the power source and the power ON/OFF switch is in the ON position.
	Input power fuse blown.	Replace the fuse. Refer to <a href="#">“Replacing the MasterTech Input Power Fuse”</a> on page 9-27.
Stirrer will not work.	Stirrer is improperly connected.	Check the stirrer's electrical connection.
Turntable will not move.	Arm is in the LOAD position.	Press the AUTO/LOAD switch on the front panel to lower the arm.
MasterTech pump will not run.	Pump switch on the front panel may be in the OFF position.	Press the pump AUTO/ OFF switch on the front panel.
Ultrasonic probe will not work.	Probe improperly connected to the MasterTech.	Check the MasterTech connector cable.
Ultrasonic agitation diminished.	The ultrasonic probe tip may need replacing.	Refer to <a href="#">“Replacing the Ultrasonic Probe Tip”</a> on page 9-26.
MasterTech will not initiate commands from the computer.	The cable may be connected improperly from the MasterTech to the computer.	Check the cable connections.
Pump leaks or is not operating efficiently.	Tubing is leaking or clogged.	Refer to <a href="#">“Replacing Flexible Tubing”</a> on page 9-13.

## Preventive Maintenance

The following procedures should be performed every 12 months by a Micromeritics service technician. Do not attempt to perform these procedures yourself.

- Clean the high voltage area
- Calibrate the X-ray control system
- Calibrate the fluid control system
- Calibrate the temperature control system

## Schedule

The following table lists the preventive maintenance procedures you should perform to keep your analyzer operating at peak performance. (These procedures are also performed by your service technician at the same time as the ones listed above.) Instructions for each procedure follow the table.

Maintenance Required	Frequency	Refer to Page
Perform a reference material run	Every week	9-8
Clean the analyzer	Every 30 days*	9-8
Clean the mixing chamber and bezel	As needed	9-8
Clean the analysis cell	Every 30 days*	9-10
Replace the mixing pump and cell pump tubing	Every 30 days*	9-13
Replace the analysis cell tubing	As needed	9-16
Clean the air filter	Every 30 days*	9-17
Check the operation of the mixing pump	Every 30 days*	9-18
Check the operation of the cell pump	Every 30 days*	9-19
Check the level of the analyzer	Every 30 days*	9-20
Clean the collimating slits	As needed	9-21
*Or every 160 analyses, whichever comes first		

## Performing a Reference Material Analysis

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It's good practice to perform a reference material analysis every week to ensure that the analyzer is operating within specifications. Reference material kits, including instructions for performing the reference material analysis, are available from Micromeritics (refer to **Chapter 10, Ordering Information**).

## Cleaning the Analyzer

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A clean cloth, dampened with isopropyl alcohol (IPA), a mild detergent or a 3% Hydrogen Peroxide solution may be used to clean the outside casing of the analyzer. It is not necessary to remove any control knobs or screws while cleaning. If you have a MasterTech installed on your SediGraph 5120, it may be cleaned in the same manner.



**Isopropyl alcohol (IPA) should not be used to clean the sliding door to the analysis compartment.**

## Cleaning the Mixing Chamber and Bezel

---

The mixing chamber bezel should be cleaned periodically to prevent contaminants from entering the mixing chamber. To clean the bezel:

- Remove the bezel and clean using a mild detergent. Rinse, then dry thoroughly before replacing it on the mixing chamber.

The mixing chamber should be removed and cleaned periodically to remove any residue.



**When cleaning the mixing chamber, avoid getting the electrical connections wet. Do not immerse the chamber in liquid. Doing so could damage the system.**

1. Drain the mixing chamber.
  - a. Select **Unit [n] > Drain and Load**.
  - b. Select *Leave mixing chamber empty*; then select **Continue**.
  - c. When prompted to load the sample, select **Cancel**.

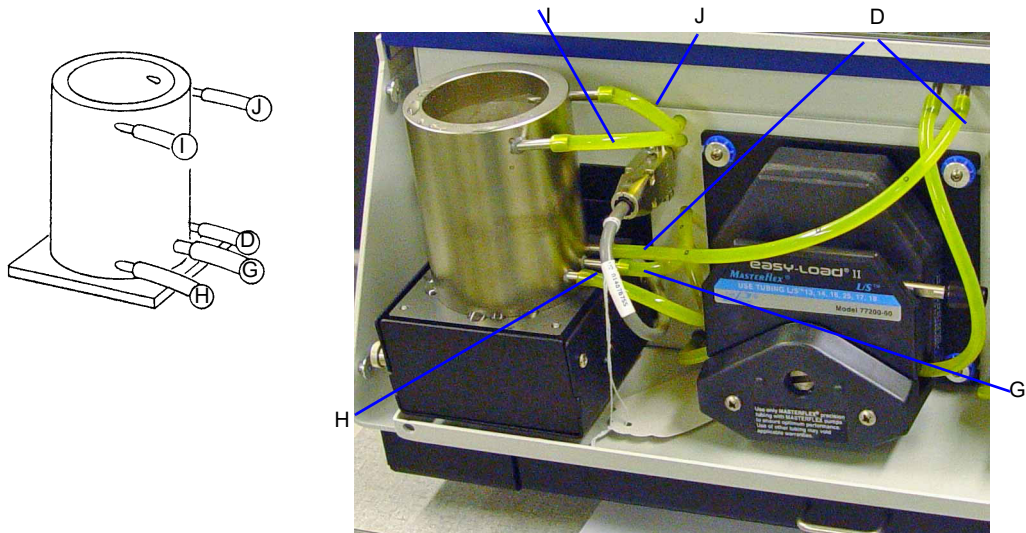
2. Disconnect the flexible tubing from the mixing chamber, exercising caution to prevent damage to the tubing. Disconnect the electrical cable.



3. Clean the chamber using IPA or a mild detergent. Rinse thoroughly. All ports should be cleaned using an air blower.
4. Reconnect the tubing to the mixing chamber (refer to Reconnecting the Mixing Chamber Tubing below).

## Reconnecting the Mixing Chamber Tubing

1. Attach the tubing to the mixing chamber as shown below.



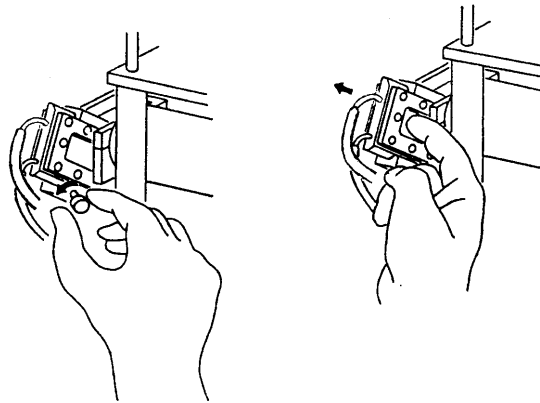
2. Make sure the tubing is securely fastened at each port.
3. Reconnect the electrical cable.

## Cleaning the Analysis Cell

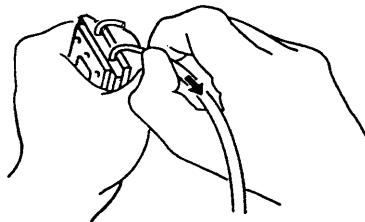
---

The analysis cell should be removed periodically and cleaned to remove any residue.

1. **Select Unit [n] menu > Drain and Load.**
2. Select *Leave mixing chamber empty*, then **Continue**.
3. When prompted to load the sample, select **Cancel**.
4. Place the PUMP CONTROL switch on the analyzer front panel in the OFF position.
5. Open the transparent sliding door to the analysis compartment. Loosen the cell mounting screw and remove the cell from the retaining bracket as shown below.

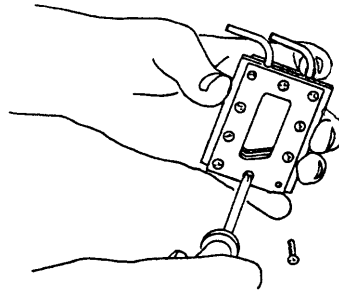


6. Carefully remove the flexible tubing from the rigid tubing connector which is mounted along the right side of the analysis compartment.
7. Carefully remove the flexible tubing from the two ports on the cell.



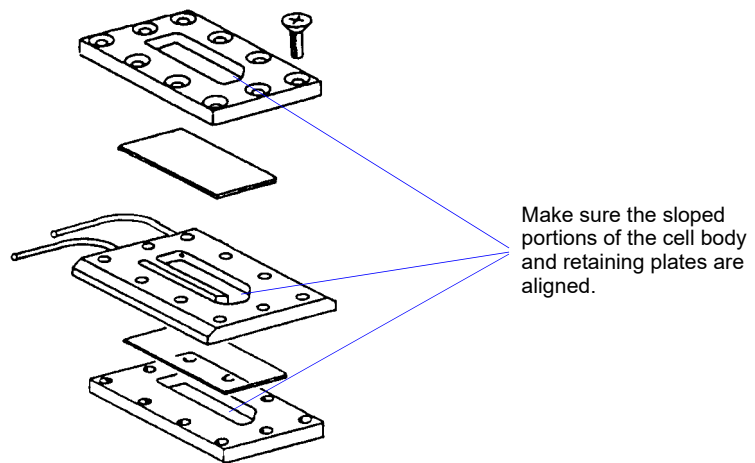


8. Disassemble the cell by removing the ten screws in the cell window retaining plates.



**Do not use cloth made of a coarse material or abrasive cleansers when cleaning the cell windows. Particles may lodge in scratches, which could alter X-ray pulse rates and cause invalid analysis results.**

9. Use either IPA or a mild detergent to clean the cell windows. Use an air blower to remove any debris from the cell body, window retaining plates, and ports.
10. Assemble the cell by placing a cell window and a cell window retaining plate on each side of the cell body. The cell window retaining plate must be positioned so that the sloped part matches that of the cell body and other plate.

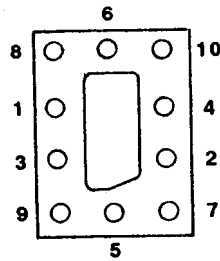


11. Insert the ten screws removed in step 8 into the window retaining plates, **but do not tighten.**

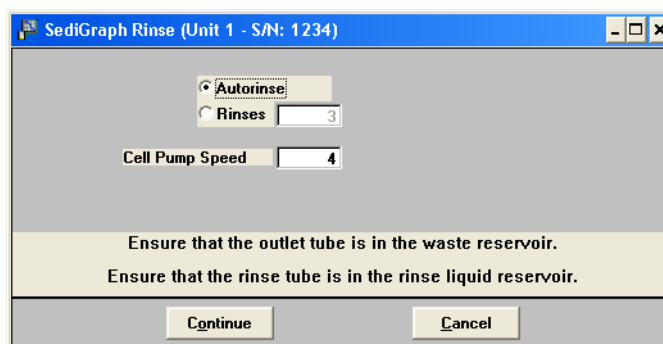


**When assembling the cell, be sure to alternate the tightening of screws. Failure to do so could result in air entering the cell, causing bubble elimination problems.**

- Using a screwdriver, tighten the screws around the cell by tightening one screw and then tightening the screw diagonally opposite that screw. (Refer to the following illustration for the tightening sequence.) This sequence helps to ensure uniform closure around the cell.



- Connect the flexible tubing to the ports on the analysis cell and to the rigid tubing connector. The tubing for the front port of the cell connects to the front rigid tubing connector and the tubing for the rear port of the cell connects to the rear rigid tubing connector.
- Insert the cell in the retaining bracket and tighten the cell mounting screw.
- Place the PUMP CONTROL switch in the ON position.
- Select **Unit [n] > Rinse > SediGraph**; the SediGraph Rinse dialog box is displayed.



- Select *Autorinse*, then **Continue** to rinse the analysis cell.

## Replacing Flexible Tubing

The SediGraph includes a complete plumbing system for circulation of sedimentation liquid and particle suspension between the cell, the mixing chamber, an external rinse container, and an external waste container. In order for the system to operate properly, you must replace damaged or deteriorated tubing. You can replace tubing from the mixing pump, the cell pump, and the analysis cell independently.

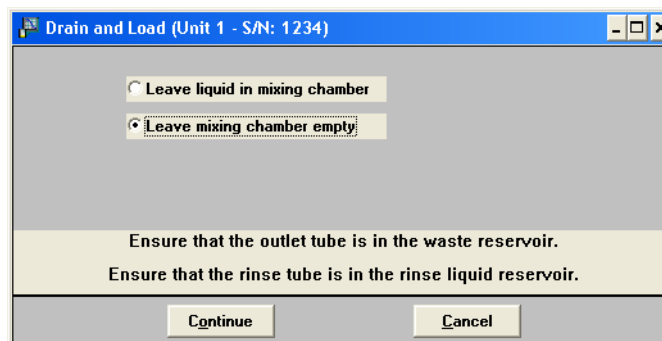


**The tube installation tool included in the instrument accessories may be used to help install the tubing.**

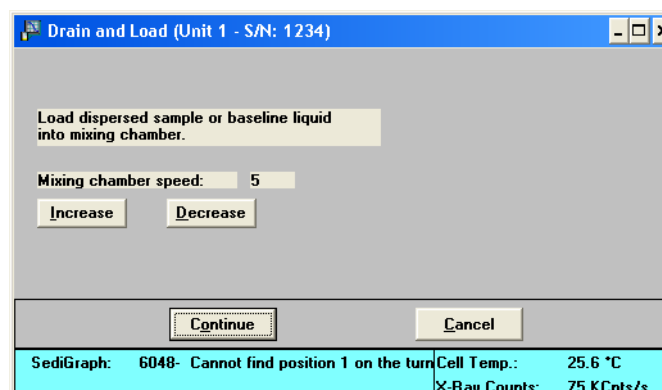
When replacing tubing, always drain the system first as described below.

### Draining the System

1. Ensure that the outlet tube is in the waste reservoir and the rinse tube is in the rinse liquid reservoir.
2. Select **Unit [n] > Drain and load**; the Drain and Load dialog is displayed.



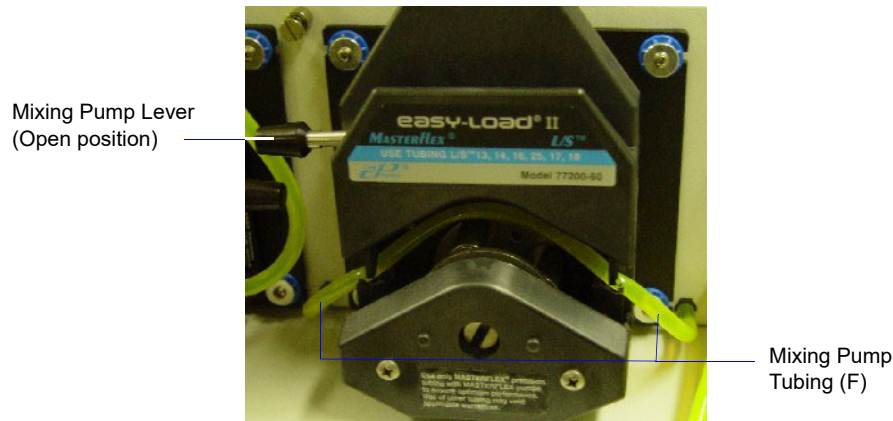
3. Select **Leave mixing chamber empty**, then click **Continue**. A progress message is displayed, then the dialog shown below displays.



4. Click **Cancel**.

## Replacing the Mixing Pump Tubing

1. Place the SediGraph on the edge of a table or flat surface.
2. Remove the pump chassis cover.
3. Drain the system. Refer to [“Draining the System” on page 9-13](#).
4. Place the PUMP CONTROL switch on the analyzer front panel in the OFF position.
5. Rotate the mixing pump lever (the mixing pump is the pump on the right) to the left to place the mixing pump housing in the open position.



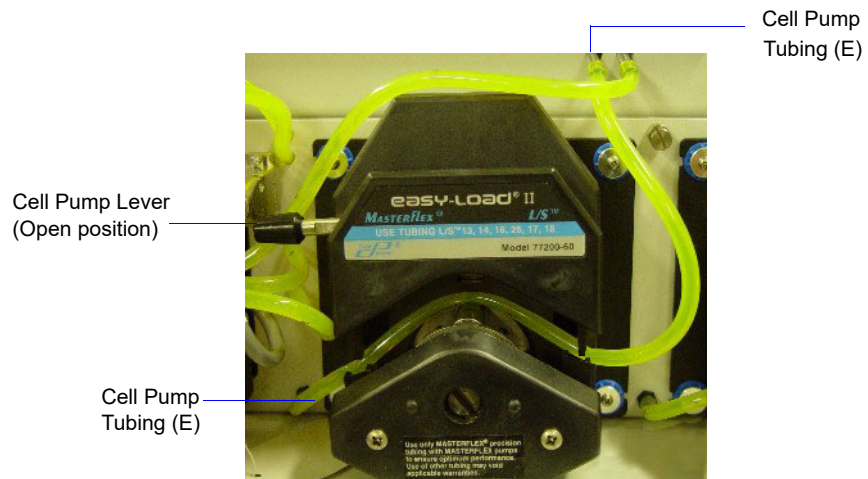
6. Remove the mixing pump flexible tubing from the rigid tubing connectors on both sides of the pump; discard the used tubing.
7. Using the tube installation tool supplied in the accessories kit, attach one end of the new flexible tubing (labeled F) to the rigid tubing connector on the right side
8. Thread the tubing through the pump as shown below.



9. Attach the other end of the tubing to the rigid connector on the left side.
10. Rotate the mixing pump lever to the right to place the mixing pump housing in the closed position.
11. Replace the pump chassis cover.
12. Place the PUMP CONTROL switch on the analyzer front panel in the ON position.

## Replacing the Cell Pump Tubing

1. Place the SediGraph on the edge of a table or flat surface.
2. Remove the pump chassis cover.
3. Drain the system. Refer to [“Draining the System” on page 9-13](#).
4. Place the PUMP CONTROL switch on the analyzer front panel in the OFF position
5. Rotate the cell pump lever (the cell pump is the pump on the left) to the left to place the cell pump housing in the open position.



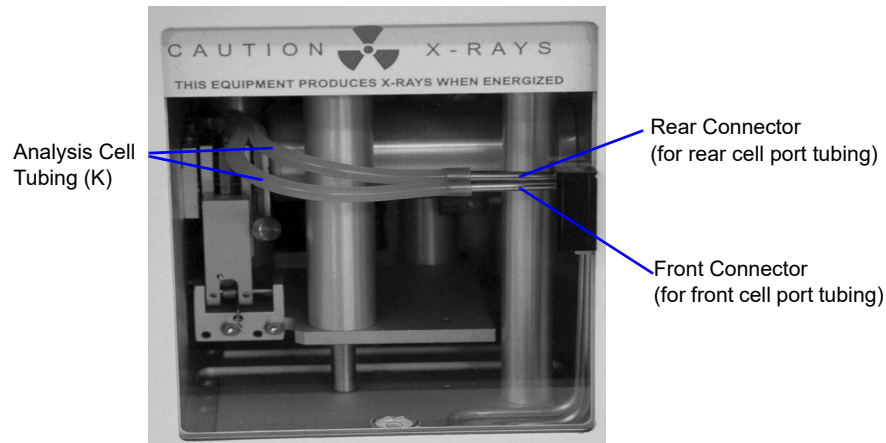
6. Remove the cell pump flexible tubing from both connectors; discard the used tubing.
7. Using the tube installation tool supplied in the accessories kit, attach one end of the new flexible tubing (labeled E) to the rigid tubing connector on the left side of the pump. .
8. Thread the tubing through the pump as shown below.



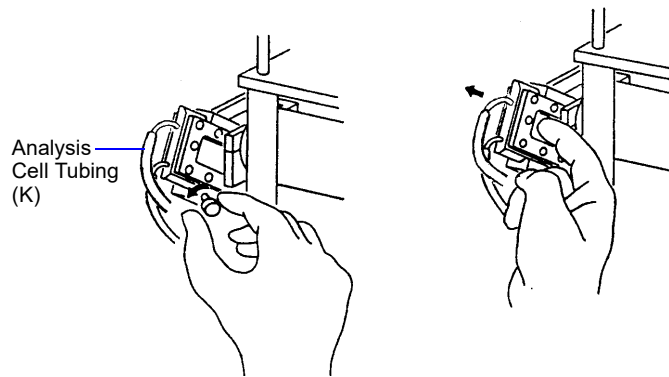
9. Attach the other end of the tubing to the connector on the right side.
10. Rotate the cell pump lever to the right to place the cell pump housing in the closed position.
11. Replace the pump chassis cover.
12. Place the PUMP CONTROL switch on the analyzer front panel in the ON position.

## Replacing the Analysis Cell Tubing

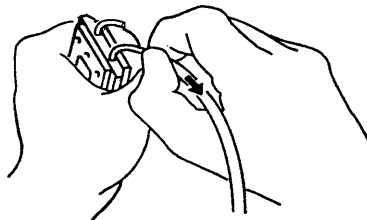
1. Drain the system. Refer to [“Draining the System” on page 9-13](#).
2. Place the PUMP CONTROL switch on the analyzer front panel in the OFF position
3. Open the transparent sliding door to the analysis compartment.



4. Remove the flexible tubing from the rigid tubing connector in the analysis compartment.
5. Loosen the cell mounting screw and remove the cell from the retaining bracket as shown below.



6. Remove the flexible tubing from the two ports on the cell.

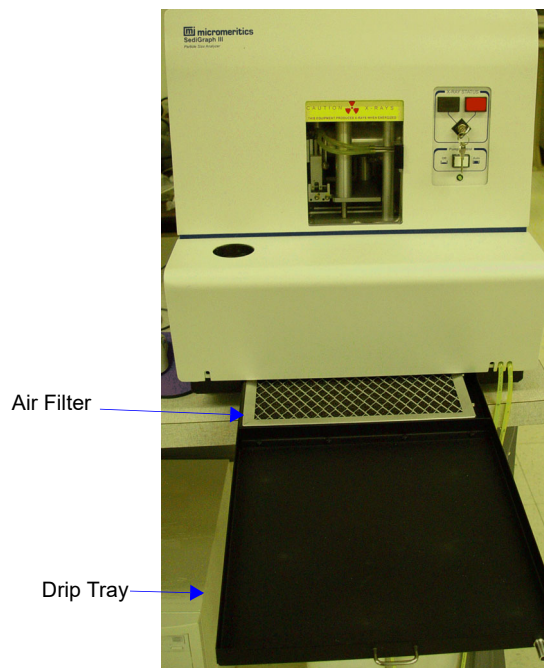


7. Connect the new flexible tubing (labeled K) to the ports on the new analysis cell and to the rigid tubing connector. The tubing for the front port of the cell connects to the front rigid tubing connector and the tubing for the rear port of the cell connects to the rear rigid tubing connector.
8. Insert the cell in the retaining bracket and tighten the cell mounting screw.
9. Close the analysis compartment door.
10. Place the PUMP CONTROL switch in the ON position.

## Cleaning the Air Filter

The air filter on the SediGraph should be cleaned every 30 days (more often in environments with increased levels of dust) and replaced once a year. Refer to **Chapter 10, Ordering Information** for the part number of the air filter.

1. Slide out the drip tray on the front of the analyzer.

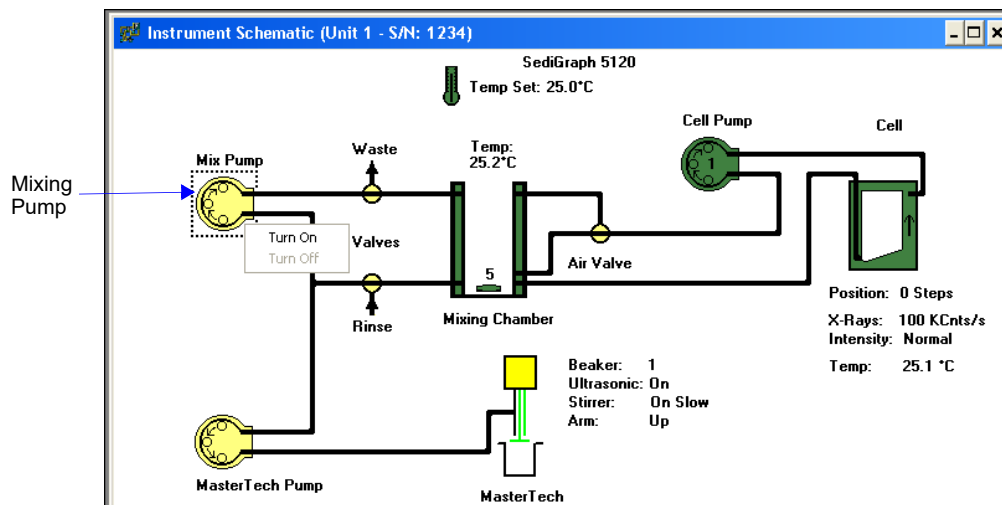


2. Remove the air filter from drip tray by squeezing the filter while pulling it away from the drip tray.
3. Rinse the filter thoroughly and shake out the excess water. Place it aside and allow it to dry.
4. Install a new filter or after the filter has dried, replace it.
5. Check to see that the analyzer is level. Refer to [“Checking the Level of the Analyzer” on page 9-20](#).

## Checking the Operation of the Mixing Pump

The mixing pump should be checked every 30 days (or every 160 runs, whichever comes first) to see if it is operating correctly. To check the operation of the mixing pump:

1. If the instrument schematic is not displayed, select **Show Instrument Schematic**.
2. Select **Unit [n] > Enable manual control**.
3. Right-click on the Mixing Pump symbol, then select **Turn on** from the pop-up menu.



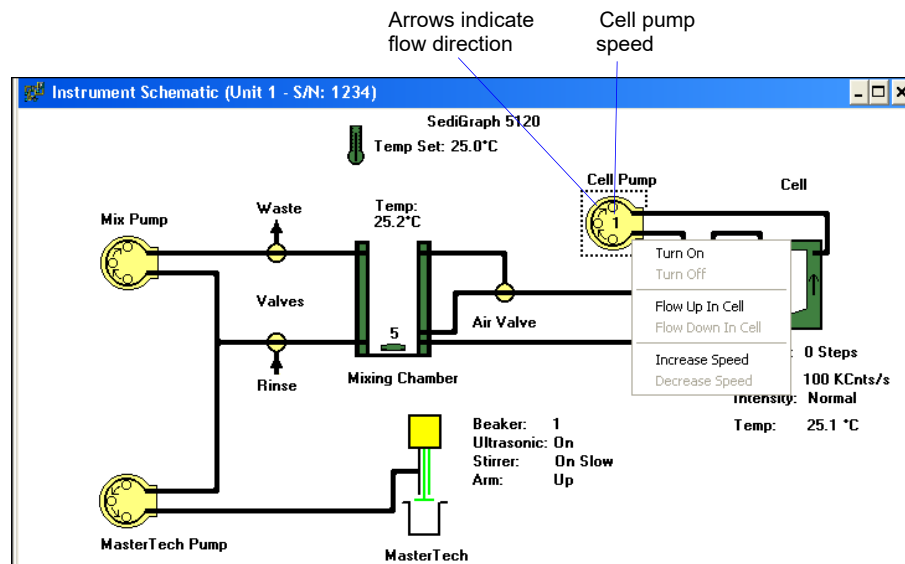
4. If the pump fails to start, refer to the table on [“Resetting the Mixing Pump and Cell Pump”](#) on page 9-26 for corrective action.
5. Right-click on the Mixing Pump symbol, then select **Turn off** from the pop-up. If the pump fails to stop, the fluid control board may need replacing; contact your service representative.



## Checking the Operation of the Cell Pump

The cell pump should be checked every 30 days (or every 160 runs, whichever comes first) to see if it is operating correctly. To check the operation of the cell pump:

1. If the instrument schematic is not displayed, select **Show Instrument Schematic**.
2. Select **Unit [n] > Enable manual control**.
3. Right-click on the Cell Pump symbol, then select **Turn on** from the pop-up.



4. Perform the following steps. If any of these steps fail, refer to the table on [“Resetting the Mixing Pump and Cell Pump”](#) on page 9-26 for corrective action.
  - a. Right-click on the Cell Pump symbol and select **Increase speed** from the pop-up menu.
  - b. Right-click on the Cell Pump symbol, then select **Decrease speed** from the pop-up menu.
  - c. Right-click on the Cell Pump symbol, then **Flow up in cell** from the pop-up menu.
  - d. Right-click on the Cell Pump symbol, then select **Flow down in cell** from the pop-up menu.
  - e. Right-click on the Cell Pump symbol and select **Increase speed** from the pop-up menu.
  - f. Right-click on the Cell Pump symbol, then select **Decrease speed** from the pop-up menu.
5. Right-click on the Cell Pump symbol, then select **Turn off** from the pop-up menu. If the pump fails to stop, the fluid control board may need replacing; contact your service representative.

## Checking the Level of the Analyzer

---

An unlevel analyzer may cause inaccurate analyses. Check every 30 days to see if the analyzer is level.

1. Open the analysis compartment door and locate the level indicator.
2. Look straight down at the indicator. The analyzer is level when the bubble is centered inside the black circle on the level indicator.



← Level Indicator

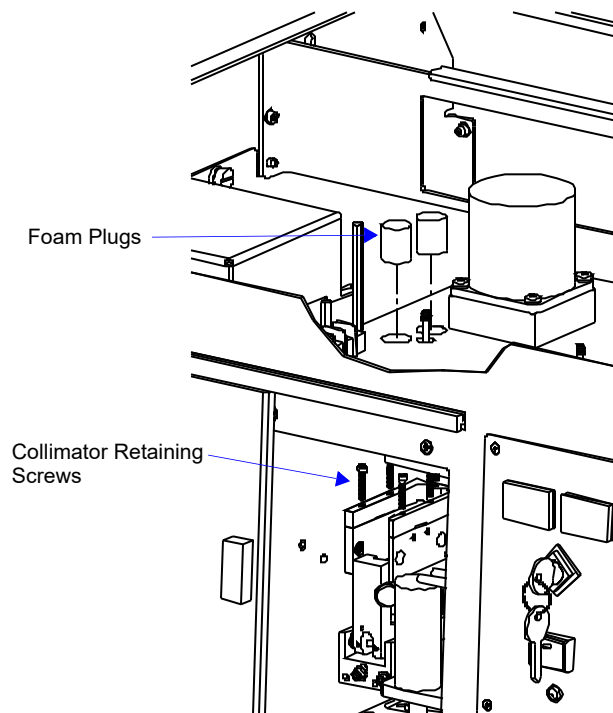
3. If the analyzer is not level, lift the corner of the SediGraph, then turn the appropriate foot counterclockwise to raise the unit or clockwise to lower the unit.
4. Set the analyzer back down and observe the indicator. The bubble should be centered inside the black circle on the level indicator.

## Cleaning the Collimating Slits

The collimating slits may become blocked by dust or debris which accumulates in the analysis compartment over a period of time, causing inaccurate results.

To clean the collimating slits:

1. Place the analyzer ON/OFF switch in the OFF position.
2. Remove the retaining screws from the top of the analyzer; then remove the top panel.
3. Remove the analysis cell. Refer to **Cleaning the Analysis Cell** in this chapter for removal instructions.
4. Remove the two foam plugs in the top of the analysis module.
5. Use a hex driver with an extension to remove the collimator retaining screws.
6. Reach through the door of the analysis compartment to lift the top collimator out of the analysis module.



7. Use a lint-free cloth to clean the shiny area near the center of the collimator you have removed and the corresponding area of the collimator remaining in the analysis module.



**Do not use cloth made of a coarse material or abrasive cleansers when cleaning the collimating slits.**

8. Replace the top collimator and the retaining screws.



**Tighten the collimator retaining screws only enough to securely hold the collimator in place. Over-tightening the screws can close the collimating slits, reducing the intensity of (or completely blocking) the X-rays.**

9. Tighten the retaining screws for the top collimator.
10. Replace the two foam plugs in the top of the analysis module.
11. Replace the analysis cell and the top panel.
12. Place the analyzer ON/OFF switch in the ON position.

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## Routine Maintenance

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### Replacing the X-Ray Indicator Lamps

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The X-RAY STANDBY indicator and the X-RAY ON indicator on the front panel of the SediGraph contain an internal lamp. If either of these lamps burn out, perform the following steps to replace it.

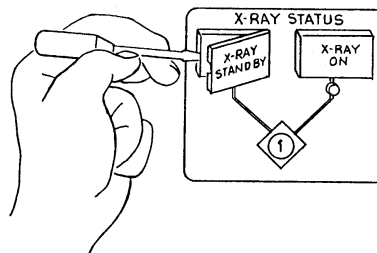


**If the X-RAY ON indicator lamp is burned out or installed incorrectly, the instrument will be inoperative.**

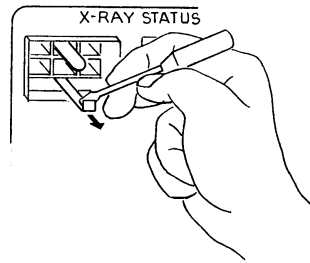


**Disconnect the SediGraph power cord from the AC power source before attempting to replace the lamp. Failure to do so could result in electrical shock or damage to the instrument.**

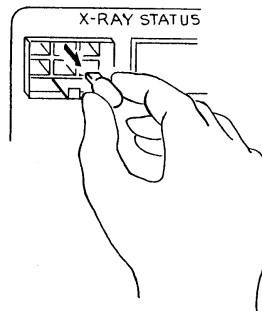
1. Remove the cover lens from the SediGraph by prying with a flat object as shown below.



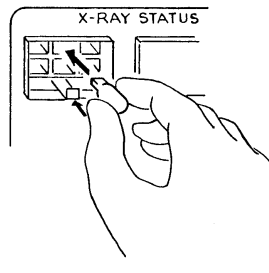
- Using a flat object, pull the lever which raises the lamp socket out of the lamp compartment as shown below. This makes the lamp accessible.



- Remove the lamp by pulling it away from the socket.



- Push lamp socket lever toward the SediGraph and insert replacement lamp into socket.



- Replace the indicator cover lens.
- Connect the SediGraph power cord to an AC power source. Place the ON/OFF switch in the ON position and place the keyswitch in the appropriate position. Verify that the lamp is working.

## Replacing the Cell Windows

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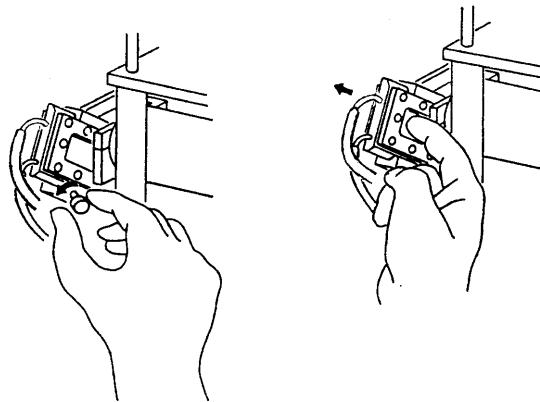
X-ray photons from the X-ray source pass through the cell windows to the X-ray detector on the other side of the cell. If cell windows become scratched or damaged, settling particles may become entrapped. This could alter X-ray pulses, resulting in invalid analyses. The analysis cell windows should be replaced when necessary. Refer to [“Cleaning the Analysis Cell” on page 9-10](#).

## Replacing the Analysis Cell Assembly

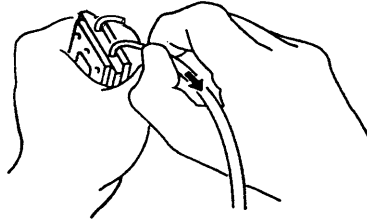
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If the analysis cell assembly becomes damaged, it may be necessary to replace it. To replace the analysis cell assembly:

1. Select **Unit [n] menu > Drain and Load**.
2. Select *Leave mixing chamber empty*; then **Continue**.
3. When prompted to load the sample, select **Cancel**.
4. Place the PUMP CONTROL switch on the analyzer front panel in the OFF position.
5. Open the transparent sliding door to the analysis compartment.
6. Loosen the cell mounting screw and remove the cell from the retaining bracket as shown below.



7. Carefully remove the flexible tubing from the two ports on the cell.



8. Connect the flexible tubing to the ports on the new analysis cell
9. Insert the cell in the retaining bracket and tighten the cell mounting screw.
10. Place the PUMP CONTROL switch in the ON position.

## Determining the Cause of Bubbles

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If bubble problems continue to exist, perform the following steps to determine their source.



**If you do not have a spare cell assembly, drain your system, remove and dry the cell assembly, then reinstall it for this procedure.**

1. Install a clean, dry cell assembly in the cell holder (refer to [“Replacing the Analysis Cell Assembly”](#) on page 9-24).
2. Select **Unit [n] > Baseline** and perform the steps for collecting baseline data. (Refer to "Performing a Baseline Measurement" in Chapter 3 if you need assistance.)

*If the analyzer is successful in obtaining a baseline*, the cell proceeds to a parked position, indicating that bubbles are caused by: improper tubing routing, a failed valve, window misalignment, or a loose inlet/outlet port on the cell assembly. Refer to ["Bubble elimination problem"](#) in the table on page 9-5.

*If the analyzer is unable to obtain a baseline*, an error message appears in the lower status window. This indicates X-ray detection and/or generation problems may be present. Contact your Micromeritics service representative for corrective action.

## Resetting the Mixing Pump and Cell Pump

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If an electrical overload occurs with the mixing pump or the cell pump, reset the pumps as follows:

1. Place the PUMP CONTROL switch on the front panel in the OFF position.
2. Allow the internal varistor to cool down (approximately two to three minutes).
3. Check the tubing to verify that it is routed properly.
4. Place the PUMP CONTROL switch in the AUTO position.
5. Verify pump operation (refer to [“Checking the Operation of the Mixing Pump”](#) on page 9-18 and [“Checking the Operation of the Cell Pump”](#) on page 9-19).

Contact your Micromeritics service representative if the problem continues.

## Replacing the Ultrasonic Probe Tip

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After extended periods of use, the tip of the ultrasonic probe on the MasterTech may become pitted, causing diminished agitation. If this occurs, replace the tip as described below.



**Refer to Chapter 10, Ordering Information, to determine the correct part to be used with your probe assembly.**

1. Remove the damaged tip from the probe using two 9/16 in. wrenches.
2. Attach the new probe tip to the probe body. Use the wrenches to tighten securely.



**Never hold the probe by the tip; doing so may cause damage to the probe.**

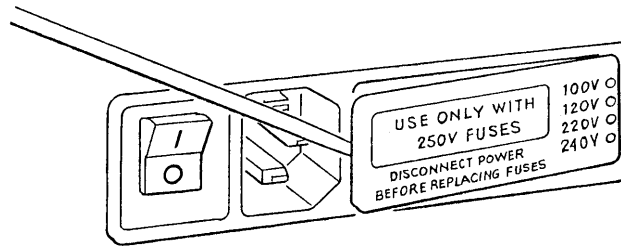


## Replacing the MasterTech Input Power Fuse



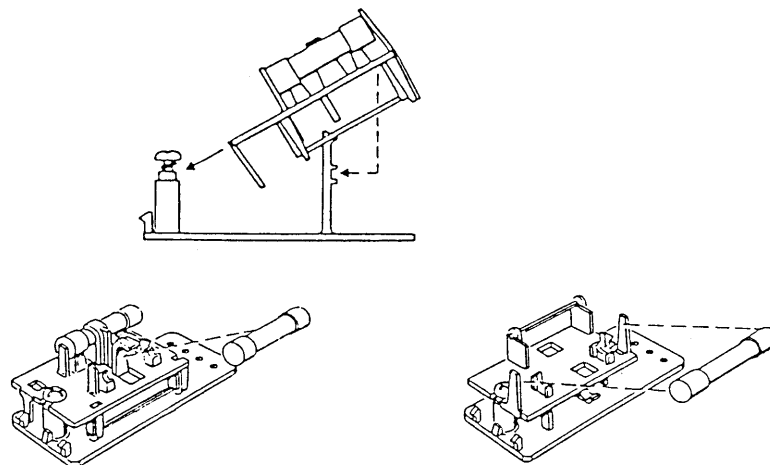
The power cord should be disconnected from the MasterTech before removing the cover from the power input connector. Failure to disconnect the power cord could result in electrical shock.

1. Make sure the power cord is disconnected from the MasterTech.
2. Using a pointed object, remove the fuse block and cover assembly from the power connector at the rear of the MasterTech.



3. Remove the fuse from the fuse block.

The input power connector can be used with either a single-fuse arrangement or a double-fuse arrangement, as shown in the following illustration.

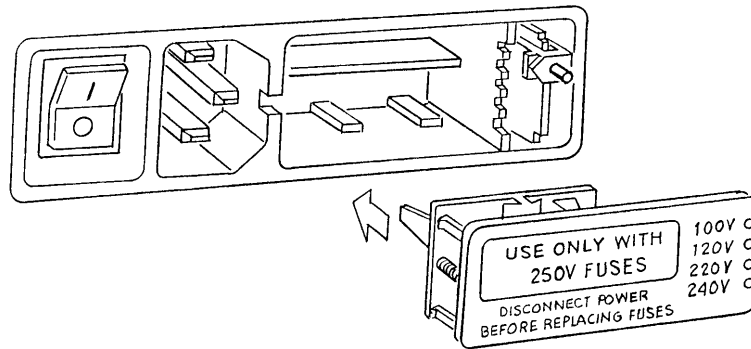


The fuses used in the MasterTech must be identical in type and rating to that specified. Use of other fuses could result in electrical shock and/or damage to the MasterTech.

4. Insert appropriate fuse(s) for the input power source. Refer to the chart below for the appropriate fuse rating.

<u>Power Source</u>	<u>Fuse</u>
100-120 VAC	3AG, 1.25 Amp Slow-Blow
200-240 VAC	5x20 mm, 0.8 Amp Slow-Blow (Type T)

5. Insert fuse block and cover assembly into input power connector (as shown in the following illustration) and snap it into place.



# 10 ORDERING INFORMATION



## Ordering Information

The SediGraph 5100 Particle Size Analysis System components and accessories can be ordered through our Customer Order Entry Department - (770) 662-3636. When ordering, please use the information provided in the following table.

Part Number	Item and Description
512-00000-00	SediGraph 5120 analyzer; includes software, operator's manual, and accessories. This represents either the only analyzer in a single-analyzer system or the first of multiple analyzers in a system.
512-00001-00	SediGraph 5120 analyzer; includes accessories. No software included. This represents an additional analyzer in a multiple analyzer system.
052-00000-00	MasterTech 052, for automatic sample preparation. Redisperses samples and transfers them to the SediGraph for analysis. Includes built-in mechanical stirrer and ultrasonic probe.
003-60101-06	Power cord, shielded
003-20665-00	Interface cable, shielded
003-39046-00	Lamp for analyzer front panel x-ray status indicators
511-25892-00	SediGraph cell
511-25866-00	High settling velocity cell
510-32801-01	Cell window, set of 2
510-32804-01	Cell window, Homalite <sup>®</sup> , set of 2
512-27600-01	Filter, air, 10 ppi (washable), for analyzer
512-27600-02	Filter, air, 25 ppi (washable), for analyzer
512-27600-03	Filter, air, 45 ppi (washable), for analyzer
512-32820-01	Tubing set, Tygon <sup>®</sup> , universal, pre-cut
512-32821-01	Tubing set, Tygon, for mixing chamber pump and cell pump
512-32820-04	Tubing set, Silicone, universal, pre-cut
512-32821-04	Tubing set, Silicone, for mixing chamber pump and cell pump
512-32820-03	Tubing set, Viton, universal, pre-cut
512-32821-03	Tubing set, Viton, for mixing chamber pump and cell pump

<b>Part Number</b>	<b>Item and Description</b>
512-32820-02	Tubing set, universal, pre-cut
512-32821-02	Tubing set, universal, for mixing chamber pump and cell pump
512-62600-00	Peristaltic pump head, for cell or mixing chamber pump (no motor)
500-25610-00	Magnetic stirring bar
004-25053-00	Spatula
004-61021-00	Beaker, 100 mL
004-61050-00	Bottle, 10L
004-61050-01	Modified cap for 10L Bottle
512-33601-00	Recommended operating supplies kit, includes: 2 plastic 10-Liter bottles, 2 magnetic stirring bars, 8 cell windows, 2 analyzer air filters, 5 sets Tygon and 2 sets Silicone tubing.
004-16800-00	Sedisperse sampler kit
004-16837-00	Reference material, garnet (~3.77 $\mu\text{m}$ ) - Traceable to NIST
004-16811-00	Reference material, garnet (~11.0 $\mu\text{m}$ )
004-16814-00	Reference material, glass (~1.5 $\mu\text{m}$ )
004-16835-00	Reference material, fine particle size (~0.77 $\mu\text{m}$ ) - Traceable to NIST
512-42801-00	SediGraph 5120 Operator's Manual
512-33001-00	SediGraph 5120 Operator's Manual and current software
500-58902-00	Ultrasonic probe, 250 Watts, 115 Volts (not available in countries requiring CE certification)
500-58903-00	Ultrasonic probe, 250 Watts, 230 Volts (not available in countries requiring CE certification)
500-58904-00	Sound abating enclosure (for use with ultrasonic probe)
003-58601-00	Ultrasonic bath, 115 Volts
003-58602-00	Ultrasonic bath, 230 Volts
511-25870-00	Mixing chamber assembly, standard
511-25870-02	Mixing chamber assembly, stainless, for high pH resistance
512-25807-01	Mixing chamber cover bezel

Part Number	Item and Description
<b>MASTERTECH ACCESSORIES</b>	
004-54134-00	Wrench, 9/16 in., ignition open end
051-14811-00	Evaporation cover
051-14814-00	Turntable assembly
051-32901-00	Tubing set, Tygon®, pre-cut
052-32802-00	Tubing, MasterTech to SediGraph
051-58600-06	Ultrasonic probe tip, for use with units that have ultrasonic probe cables with connectors at both ends of the cable. One connects to the top of the probe and the other to the MasterTech.
051-58605-02	Ultrasonic probe tip, for use with units with serial number 151 and greater, which have only one connector that connects to the MasterTech.
051-61702-01	Beaker, molded, 125 mL without spout, PE
052-54600-00	Key, Tubing loading





# **A      ERROR MESSAGES**



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## Error Messages

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This chapter contains a numerical listing of the error messages associated with the SediGraph 5120 analysis program. If the Action response for the message instructs you to contact your Micromeritics service representative, record the error message and make backup copies (if appropriate) of any files involved in the operation.

### **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 Micromeritics service representative if you continue to receive this error message.

### **2430- Error accessing file (file name), error code = (number).**

*Cause A:* Diskette may be damaged.

*Action A:* Clean the diskette drive. If this does not eliminate the problem, attempt the operation using a backup copy of the file.

*Cause B:* Hard disk may be damaged.

*Action B:* Contact your Information Technology department or perform hard disk diagnostics.

*Cause C:* A software error occurred when the file was accessed.

*Action C:* Contact your Micromeritics service representative.

*Cause D:* The name specified contains one or more invalid characters.

*Action D:* Enter a valid file name; do not use characters such as \* or ?.

**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 diskette, 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 Micromeritics 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 have been added to this directory by some function other than the SediGraph 5120 analysis program.

*Action:* Click **Yes** to update the directory information with data from each new file. This operation may take a minute.

Click **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 Micromeritics 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 selected a disk drive that is not presently accessible.

*Action:* Ensure that the drive is not write-protected.

**2439- Cannot 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 unrecoverable error occurred when you tried to access a data file.

*Action:* Contact your Micromeritics service representative.

**2448- (directory type) 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:* Enter a valid file name. A file name can contain up to eight alphanumeric characters.

**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.**

*Cause:* You requested a *File/Print* operation on multiple files with the destination specified as a disk file. All of these files cannot be processed in a single operation.

*Action:* Only the number of files indicated in the message will be processed. When these are complete, return to the *File/Print* menu selection and generate the reports for 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 requested a *File/Export* operation on multiple files with the destination specified as a disk file. All of these files cannot be processed in a single operation.

*Action:* Only the number of files indicated in the message will be processed. When these are complete, return to the *File/ Export* menu selection and generate the reports for the remainder.

**2456- Insufficient file handlers available. Application cannot continue.**

*Cause:* The analysis program has attempted to reserve space for the disk files which it will require. This attempt has failed.

*Action:* Modify the "files=" entry in the CONFIG.SYS file to have a value of 80 or greater. Re-boot the computer and attempt to restart the application. If this message persists, contact your Micromeritics service representative.

**2457- Results cannot be displayed. More than (n) windows are currently displaying or printing results.**

*Cause:* You requested a report either to the screen or to the printer. This request exceeds the maximum number of reports which may be active at one time.

*Action:* Close some of the report-to-screen displays currently visible. If reports are active to the printer, wait until they have completed, then repeat your request for a report.

**2458- An instrument is performing a critical operation. Wait a few moments before exiting the application.**

*Cause:* You tried to exit the WIN5120 analysis program while the instrument is performing a critical operation. This operation must be completed before you can exit.

*Action:* Wait a short time and try to exit 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 tried to exit the WIN5120 analysis program while an analysis is in progress. While this is possible, the data collected while the WIN5120 analysis program is inactive will not be permanently recorded until the analysis program is re-started. A power failure to the instrument could cause some data to be lost.

*Action:* If you are not concerned with potential loss of data if a power failure occurs, click **Yes** to continue with the exit; click **No** if you wish to wait for the analysis to finish.

**2460- Fatal Communications error on (Unit n - S/N: nnnn)**

*Cause:* There was a fatal error in the serial communications between the WIN5120 analysis program and the analyzer. All displays for that analyzer will be closed.

*Action:* Ensure that the analyzer is connected to the computer on the communications port configured by the Setup program. Stop and restart the WIN5120 analysis program. If the restarted application cannot establish communications with the analyzer, turn the analyzer off, then back on. If this error persists, contact your Micromeritics service representative

**2461- No instruments are in operation. This application will unconditionally terminate.**

*Cause:* At least one instrument must be active for the WIN5120 analysis program to operate. The initialization of all of the instruments configured with the Setup program has failed.

*Action A:* Usually this message is preceded by another message giving the reason for the instrument's failure to initialize. Refer to the explanation for that message.

**2471- Unit n - S/N: nnnn has an invalid communications port specified. It cannot be initialized.**

*Cause:* The communications port associated with this unit was not valid.

*Action:* Run the setup program and set up the unit on a valid port.

**2474- Unit n - S/N: nnnn communications port specified in the program control files is already in use. Unit cannot initialize.**

*Cause:* The communications port associated with this instrument is in use by some other program in the system.

*Action:* Close the other program to release the port. Restart the WIN5120 analysis program.

**2475- Unit n - S/N: nnnn communications port specified in the program control files cannot be accessed. Unit cannot initialize.**

*Cause:* The communications port associated with this unit was not valid.

*Action:* Run the Setup program and configure the unit on a valid port.

**2476- Unit n - S/N: nnnn startup failed. Cannot initialize the communications port.**

*Cause:* The communications port associated with this unit was not valid.

*Action:* Run the Setup program and configure the unit on a valid port.

**2477- Unit n - S/N: nnnn did not properly initialize.**

*Cause A:* There were communication problems between the computer and the analyzer.

*Action A:* Check the communication cables and make sure they are connected securely.

*Cause B:* You selected **Cancel** during initialization.

*Action B:* None required.



**2478- Error copying sequential data segment.**

*Cause:* An internal processing and/or hardware error occurred while accessing a portion of a sample file.

*Action:* Confirm that the media being accessed does not contain errors; for example, you may wish to use a utility such as ScanDisk. Contact your Micromeritics service representative if you continue to receive this error message.

**2479- Unit n - S/N: nnnn The instrument is busy performing an operation of which this application is unaware. Do you want to cancel?**

*Cause:* During initialization, the instrument was found to be analyzing, but the WIN5120 analysis program has no record of it.

*Action:* Click **Yes** to cancel the analysis and synchronize the WIN5120 analysis program with the instruments status. Click **No** to abort the initialization and allow the analyzer to continue the analysis.

**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 box.

**2481- 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:* Diskette may be damaged.

*Action B:* Clean the diskette drive. If this does not eliminate the problem, attempt operation using a backup copy of the file.

*Cause C:* Hard disk may be damaged.

*Action C:* Contact your Information Technology department or perform hard disk diagnostics.

*Cause D:* A software error occurred when the file was accessed.

*Action D:* Contact your Micromeritics 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.

**2485- The service test file has an invalid status and cannot be used for this analysis.**

*Cause:* The selected service test file has a status other than No Analysis.

*Action:* Select a different service test file or create a new one and use **Replace All** to copy parameters from the file you originally selected.

**2486- Cannot construct (name) report type. Program will terminate.****2487- Cannot start report generator. Error code (number). Program will terminate.**

*Cause:* An internal processing and/or hardware error has occurred.

*Action:* Contact your Micromeritics service representative if you continue to receive this error message.

**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 file containing initialization information and system options information used during program startup does not exist.

*Action A:* Restore the WIN5120.INI file from a backup of your system.

*Action B:* Reinstall the SediGraph 5120 analysis program.

**2491- Highlighted fields contain errors. Please correct the errors before closing dialog box.**

*Cause:* The highlighted field(s) contain an invalid entry. You must correct the error before you can close the dialog box.

*Action:* Check the entry and correct the error, then close the dialog box.

**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.**

*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.

**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 a value within the indicated range.

**2496- Invalid number.**

*Cause:* You entered an invalid number in the highlighted field.

*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.

**2498- The requested change to the Sample's status is invalid at this time.**

*Cause:* A request to change the file's status (for example, from automatically collected to manually entered) could not be done.

*Action:* Contact your Micromeritics service representative if you continue to receive this error message. Record the name of the sample file in which the problem occurred.

**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- 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 are open and consuming the system resources available to all applications.

*Action:* Close one or more windows on the screen. Contact your Micromeritics service representative if you continue to receive this error 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.

**2503- Error converting file (file name). Could not create DIO intermediate file.**

*Cause A:* Insufficient space is available on the hard disk. The DIO file is placed in the directory specified by the TEMP environment variable.

*Action A:* Determine if there is sufficient space on the drive where the TEMP directory is located.

*Cause B:* An internal processing and/or hardware error has occurred.

*Action B:* Contact your Micromeritics service representative if you continue to receive this error message.

**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 Micromeritics service representative if you continue to receive this error message.

**2505- Error Logger cannot be initialized!! Error code (number).**

*Cause:* An internal processing and/or hardware error has occurred.

*Action:* Contact your Micromeritics 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:* Select a different output device in the System Configuration dialog box. 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 is a valid file.

**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 Micromeritics 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 Micromeritics service representative.

**2511- Print job (name) has been canceled 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 5 megabytes of free space for normal operation.

**2512- Print job (name) canceled. (number)**

*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 alleged 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 containing the alleged calibration file 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.

**2516- Warning: Keeping a backup copy of the calibration data is recommended by Micromeritics. Would you like to do so now?**

*Cause:* You have performed a calibration operation; a backup copy is recommended.

*Action:* Perform a calibration **Save** operation.

**2517- Canceling this dialog will reset the calibration state to what it was when this dialog was first opened. Are you sure you want to cancel?**

*Cause:* You have not accepted the calibration you performed.

*Action:* If the calibration operation was successful, press **Accept**.

**2519- Entered or merged data must have at least two points with unique mass percent values.**

*Cause:* The entered and/or merged data included in the report being attempted does not have sufficient unique mass percent values.

*Action:* Review the entered or merged data. There must be at least two points and the mass percent value of the last point must be different than the mass percent value of the first point.

**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.****2527- Controller CRC error on boot block.****2528- Controller DRAM error.****2529- Controller Com1: error.****2530- Controller Com2: error.****2531- Controller debug port error.**

*Cause:* An internal processing and/or hardware error has occurred.

*Action:* Contact your Micromeritics 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 SediGraph 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 Micromeritics 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.

**2549- Error accessing online manual (name).**

*Cause:* You attempted to view the online manual but it could not be found.

*Action:* Reinstall the software. If the problem persists, contact your Micromeritics service representative.

**4200- An error occurred while loading the application control information. Data entry cannot be performed. (Code # <n>)**

*Cause:* An internal error occurred while read control information was being read from a disk file.

*Action:* The disk on which the application is installed may have failed. Contact your Micromeritics service representative and report the code number given in the message.

**4201- No reports selected.**

*Cause:* You failed to select reports in the “Reports to Generate” listbox. No output could be produced.

*Action:* Ensure that at least one report is selected for the sample and re-submit the sample for reporting.

**4202- No valid data to report.**

*Cause:* The selected analysis in the sample file activated for reporting does not contain any valid data.

*Action:* If the sample is still analyzing, wait until enough data have been collected to allow reporting. If the sample is complete, an error or operator intervention stopped this analysis before sufficient data could be collected. The analysis may be deleted from the file.

**4203- The reference file is not valid. ‘Diff. from ref.’ column was deleted.**

*Cause:* You requested a tabular report with *Difference from reference* selected as one of the columns. This quantity cannot be computed because the reference file is invalid.

*Action:* If no reference file has been specified, select one from the Report Options dialog and re-run the reports. If a file has been specified, ensure that it contains valid information.

**4204- Coarser specification file is not valid. ‘Out of spec.’ column was deleted.**

*Cause:* You requested a tabular report with **Out of Specification** selected as one of the columns. This quantity cannot be computed because the coarse specification file is invalid.

*Action:* If no specification file has been specified, select one from the Report Options dialog and re-run the reports. If a file has been specified, ensure that it contains valid information.

**4205- Finer specification file is not valid. 'Out of spec.' column was deleted.**

*Cause:* You requested a tabular report with the **Out of Specification** selected as one of the columns. This quantity cannot be computed because the finer specification file is invalid.

*Action:* If no specification file has been specified, select one from the Report Options dialog and re-run the reports. If a file has been specified, ensure that it contains valid information.

**4206- The tabular report has no valid columns selected. No report produced.**

*Cause:* You requested a tabular report with all of the columns set to *none*.

*Action:* Edit the options for that table and select a variable in at least one column of the table.

**4207- No valid data is available for this report. No report produced.**

*Cause:* The selected test in the sample file activated for reporting does not contain any valid data.

*Action:* If the sample is still analyzing, wait until enough data have been collected to allow reporting. If the sample is complete, an error or operator intervention stopped this analysis before sufficient data could be collected. The analysis may be deleted from the file.

**4208- An overlay file is not valid. It was not included in the report.**

*Cause:* The sample file you selected for overlay does not exist or contains invalid data.

*Action:* From the Report Options dialog, click **Overlays** and remove the sample file.

**4209- The reference file is not valid. The report was not produced.**

*Cause:* You selected the **Difference from Reference** graph; it cannot be computed because the reference file is invalid.

*Action:* If a reference file has not been specified, select one from the Report Options dialog and re-run the reports. If a file has been specified, ensure that it contains valid information.

**4210- Coarser specification file is not valid. The report was not produced.**

*Cause:* You selected the **Out of Specification** graph; it cannot be computed because the coarse specification file is invalid.

*Action:* If a specification file has not been specified, select one from the Report Options dialog and re-run the reports. If a file has been specified, ensure that it contains valid information.

**4211- Finer specification file is not valid. The report was not produced.**

*Cause:* You selected **Out of Specification** graph; it cannot be computed because the fine specification file is invalid.

*Action:* If a specification file has not been specified, select one from the Report Options dialog and re-run the reports. If a file has been specified, ensure that it contains valid information.

**4212- 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 “Reports to Generate” listbox. No output could be produced.

*Action:* Ensure that at least one report is selected for the sample and re-submit the sample for reporting.

**4213- Are you sure you want to delete the test?**

*Cause:* You selected **Delete** on the Collected Data editor.

*Action:* Click **Yes** to remove the indicated test from the sample file. Click **No** to have the test remain in the sample file.

**6001- An automatic analysis mode is enabled. The sample defaults may not be edited while this mode is active.**

*Cause:* One of the automatic analysis modes is active. Sample defaults may not be edited while this mode is active.

*Action:* End all automatic analysis modes on all attached units and try again.

**6002- Error accessing the sample information file (file name). (Code <n>).**

*Cause A:* You may not have full rights to the application's folders and files..

*Action A:* Contact your system administrator to have full rights granted.

*Cause B:* An error occurred when you tried to access a sample file.

*Action B:* Report the error code number given in the message to your Micromeritics service representative.

**6003- File (file name) already has all its tests filled.**

*Cause:* You tried to insert a new test into a sample which already contains eight tests.

*Action:* A single sample file can have a maximum of eight tests. If additional tests are required on this sample, you must create another sample file.

**6004- File `(file name)` cannot be analyzed. It is currently being edited.**

*Cause:* You selected a file which was still open in an editing window for analysis.

*Action:* Finish the changes to the sample file, then save and close the editing window.

**6005- The file (file name) can not be prepared for analysis. It is open for editing and contains errors.**

*Cause:* You selected a file which is currently being edited. Editing cannot be finished because the sample contains entry fields with errors.

*Action:* Correct the errors and finish editing the sample file. Then save, close the editing window, and try opening the file again.

**6006- The edit session for `(file name)` must be saved before it is prepared for analysis. Save changes and proceed with the analysis?**

*Cause:* You selected a file for analysis which is currently being edited. The changes to this file must be saved before it can be prepared for analysis.

*Action:* Click **Yes** to save the changes and proceed with the analysis. Click **No** if you wish to review the changes before you save them.

**6007- (Unit n - S/N: nnnn) Bubble elimination failed. Operation cancelled.**

*Cause A:* A wetting agent may be required to aid in bubble elimination.

*Action A:* Add one drop of Photo-Flo 200 or other wetting agent to the mixing chamber.

*Cause B:* Cold suspension fluid was introduced to the heated mixing chamber and cell, causing the release of dissolved gases.

*Action B:* Warm the suspension fluid prior to introduction, or allow it to circulate in the mixing chamber for several minutes before starting the analysis.

*Cause C:* Dispersion indicated in cell is not uniform.

*Action C:* Wait to see if bubbles are eliminated. Then check tubing for clogs or damage. Replace tubing if necessary.

*Cause D:* The sample material being analyzed requires more suspension energy.

*Action D:* Change your analysis options to increase the pump speed specified for the full-scale scan operation. After you have changed the sample file, repeat the analysis.

*Cause E:* The sample material being analyzed has a high density.

*Action E:* Change analysis options to reduce the sensitivity of the bubble detection method. After you have changed the sample file, repeat the analysis.

**6008- (Unit n - S/N: nnnn): Bubble elimination difficulties encountered.**

*Cause A:* A wetting agent may be required to aid in bubble elimination.

*Action A:* Add one drop of Photo-Flo 200 or other wetting agent to the mixing chamber.

*Cause B:* Cold suspension fluid was introduced to the heated mixing chamber and cell, causing release of dissolved gases.

*Action B:* Warm the suspension fluid prior to introduction, or allow it to circulate in the mixing chamber for several minutes before starting analysis.

*Cause C:* Dispersion indicated in cell is not uniform.

*Action C:* Wait to see if bubbles are eliminated. Then check tubing for clogs or damage. Replace tubing if necessary.

*Cause D:* Material under analysis requires more suspension energy.

*Action D:* Change the cell pump speed in your analysis options, then repeat the analysis.

*Cause E:* Material under analysis has high density.

*Action E:* Change the bubble detection method to *medium* or *coarse* in your analysis options, then repeat the analysis .

**6009- (Unit n - S/N: nnnn) Failure reestablishing full scale concentration. Analysis will continue.**

*Cause A:* The system could not reach the same level of sample suspension as during the previous full-scale scan.

*Action A:* Cancel the current analysis. Use manual control to change the cell pump speed to 5 and operate the pump for one or two minutes. Repeat the analysis.

*Cause B:* Sample residue is trapped in the system.

*Action B:* Check the tubing and fittings for clogs and residue. Squeeze the tubing at all locations where residue is trapped. Repeat the analysis.

**6010- (Unit n - S/N: nnnn) Sample concentration is low. Analysis will continue.**

*Cause A:* You used too little sample, causing a 13% change in X-ray adsorption.

*Action A:* Cancel the current analysis. Using manual control, turn on both pumps and add more dispersed sample to the mixing chamber. Restart the analysis.

*Cause B:* The sample requires more suspension energy.

*Action B:* Cancel the current analysis. Using manual control, operate the cell pump in the UP direction at pump speed 5 for one or two minutes. Restart the analysis.

**6011- (Unit n - S/N: nnnn) Sample concentration is high. Analysis will continue.**

*Cause:* You used too much sample, causing more than a 75% change in X-ray absorption.

*Action:* Cancel the current analysis. Using manual control, turn on both pumps and add more dispersing liquid to the mixing chamber to dilute the sample mixture. Restart the analysis.

**6012- (Unit n - S/N: nnnn) No x-rays detected.**

*Cause A:* The solid portion of the cell is blocking the X-rays from the detector.

*Action A:* Using manual control, move the cell to a different position.

*Cause B:* The slit in the X-ray source or detector is blocked.

*Action B:* Clean the slits in the X-ray source to remove any residue. Refer to **Cleaning the Collimating Slits** in Chapter 9.

**6013- (Unit n - S/N: nnnn) No x-rays detected due to key at Standby.****6014- (Unit n - S/N: nnnn) No x-rays detected due to door open.****6015- (Unit n - S/N: nnnn) No x-rays detected due to panel off.****6016- (Unit n - S/N: nnnn) No x-rays detected due to X-Ray filament over-current.****6017- (Unit n - S/N: nnnn) No x-rays detected due to X-Ray lamp off.**

*Cause:* No x-rays are detected due to the problem described in the error message.

*Action:* Correct the problem, then restart the operation.

**6018- (Unit n - S/N: nnnn) No x-rays detected. Automatic operation will cancel.**

*Cause A:* The solid portion of the cell is blocking the X-rays from the detector.

*Action A:* Using manual control, move the cell to a different position.

*Cause B:* The slit in the X-ray source or detector is blocked.

*Action B:* Clean the slits in the X-ray source to remove any residue. Refer to **Cleaning the Collimating Slits** in Chapter 9.

**6019- (Unit n - S/N: nnnn) No x-rays detected due to key at Standby. Automatic operation will cancel.****6020- (Unit n - S/N: nnnn) No x-rays detected due to door open. Automatic operation will cancel.****6021- (Unit n - S/N: nnnn) No x-rays detected due to panel off. Automatic operation will**



**cancel.**

**6022- (Unit n - S/N: nnnn) No x-rays detected due to X-Ray filament over-current. Automatic operation will cancel.**

**6023- (Unit n - S/N: nnnn) No x-rays detected due to X-Ray lamp off. Automatic operation will cancel.**

*Cause:* No x-rays are detected due to the problem described in the error message. The automatic operation that is in progress will be canceled.

*Action:* Correct the problem, then restart the operation.

**6024- (Unit n - S/N: nnnn) Error rinsing system. Cannot reestablish baseline concentration.**

*Cause A:* The dispersing liquid you are using is different from the one you used for measuring the baseline.

*Action A:* Perform a baseline measurement using the current dispersing liquid.

*Cause B:* Sample residue has remained in the cell.

*Action B:* Cancel the current operation. Using manual control, select the **Flow Up in Cell** direction for the cell pump at pump speed 5 for one or two minutes. Also check for clogs in the tubing and crimped tubing as necessary. Visually inspect the cell windows, clean or replace as necessary (refer to Chapter 9).

**6025- (Unit n - S/N: nnnn) Cannot find beamsplit.**

*Cause A:* The cell has been removed from the analyzer.

*Action A:* Replace the cell and resume operation.

*Cause B:* The cell elevator is not operating properly.

*Action B:* Contact your Micromeritics service representative.

**6026- (Unit n - S/N: nnnn) Cannot find beamsplit. Automatic operation will cancel.**

*Cause A:* The cell has been removed from the analyzer.

*Action A:* Replace the cell and resume the operation.

*Cause B:* The cell elevator is operating improperly.

*Action B:* Contact your Micromeritics service representative.

**6027- (Unit n - S/N: nnnn) Not enough cell travel to perform an analysis.**

*Cause A:* Cell assembly is assembled improperly.

*Action A:* Disassemble the cell assembly and reassemble. Be sure the sloped portions of the cell body and the retaining plates are aligned. Refer to **Cleaning the Analysis Cell** in Chapter 9.

*Cause B:* The upper limit switch of the cell elevator must be reset.

*Action B:* Contact your Micromeritics service representative.

**6028- (Unit n - S/N: nnnn) Not enough cell travel. Automatic operation will cancel.**

*Cause A:* Cell assembly is assembled improperly.

*Action A:* Disassemble the cell assembly and reassemble. Be sure the sloped portions of the cell body and the retaining plates are aligned. Refer to **Cleaning the Analysis Cell** in Chapter 9.

*Cause B:* The upper limit switch of the cell elevator must be reset.

*Action B:* Contact your Micromeritics service representative.

**6029- (Unit n - S/N: nnnn) Upper limit switch not found.**

*Cause A:* The cell position counter is too far out of position to find the upper limit switch. The lower limit switch may have been triggered.

*Action A:* Using manual control, move the cell to the upper limit switch; this resets the cell position counter.

*Cause B:* The cell elevator is not operating properly.

*Action B:* Contact your Micromeritics service representative.

*Cause C:* The upper limit switch is operating improperly.

*Action C:* Contact your Micromeritics service representative.

**6030- (Unit n - S/N: nnnn) Error moving cell.**

*Cause A:* Some object or the cell tubing is preventing the cell elevator from moving.

*Action A:* Check for and remove object, or reposition the cell tubing.

*Cause B:* The cell elevator is operating improperly.

*Action B:* Contact your Micromeritics service representative.

**6031- (Unit n - S/N: nnnn) Error moving cell. Automatic operation will cancel.**

*Cause A:* Some object or the cell tubing is preventing the cell elevator from moving.

*Action A:* Check for and remove any foreign object, or reposition the cell tubing.

*Cause B:* The cell elevator is operating improperly.

*Action B:* Contact your Micromeritics service representative.

**6032- (Unit n - S/N: nnnn) Temperature is not within the range of the liquid properties set.**

*Cause:* The temperature of the analysis compartment at the time of the analysis is not within the range defined by the liquid properties specified in the sample file.

*Action:* Either change the analysis compartment temperature by selecting **Unit [n] > Unit Configuration**, then clicking the **Set Temperature** button or change the liquid properties in the associated sample file.

**6033- (Unit n - S/N: nnnn) Liquid density must be less than sample density.**

*Cause:* The density of the dispersing liquid is too high for the sample being analyzed.

*Action:* Switch the dispersing liquid to one with density lower than that of the sample.

**6034- (Unit n - S/N: nnnn) Fan problem (code n,n)**

*Cause:* One or both of the cooling fans are operating at less than 70% of the normal speed. The code values are: 1,0 means the PMT fan has the problem; 0,1 means the X-ray fan has the problem; 1,1 means both fans have the problem.

*Action:* Turn off the analyzer. Contact your Micromeritics service representative.

**6035- (Unit n - S/N: nnnn) Electronics problem.**

*Cause:* An electronic component is not operating to specification.

*Action:* Turn off the analyzer. Contact your Micromeritics service representative.

**6036- (Unit n - S/N: nnnn) Using mixing chamber speed of (n) which differs from requested speed of (n). Analysis will continue.**

*Cause:* The mixing chamber speed specified in the sample file being analyzed (*requested* speed) is not the same as the speed at which the mixing chamber is currently operating.

*Action:* No action required unless the mixing chamber speed needs to be adjusted. In this case, enable manual control and adjust the speed.

**6037- (Unit n - S/N: nnnn) Fan problem (code n,n). Automatic operation will cancel.**

*Cause:* One or both of the cooling fans are operating at less than 70% of the normal speed. The code values are: 1,0 means the PMT fan has the problem; 0,1 means the X-ray fan has the problem; 1,1 means both fans have the problem.

*Action:* Turn off the analyzer. Contact your Micromeritics service representative.

**6038- (Unit n - S/N: nnnn) Electronics problem. Automatic operation will cancel.**

*Cause:* An electronic component is not operating to specification.

*Action:* Turn off the analyzer. Contact your Micromeritics service representative.

**6039- (Unit n - S/N: nnnn) Error moving turntable.**

*Cause:* The arm is in the Load position or something is preventing the beaker tray from moving.

*Action:* Make sure the arm is not in the Load position or that nothing is preventing the beaker tray from moving.

**6040- (Unit n - S/N: nnnn) Error moving turntable. MasterTech automatic operation will cancel.**

*Cause:* The arm is in the Load position or something is preventing the beaker tray from moving.

*Action:* Make sure the arm is not in the Load position or that nothing is preventing the beaker tray from moving.

**6041- (Unit n - S/N: nnnn) Error moving arm assembly.**

*Cause:* The arm is in the Load position or something is preventing the arm from moving.

*Action:* Make sure the arm is not in the Load position or that nothing is preventing the arm from moving.

**6042- (Unit n - S/N: nnnn) Error moving arm assembly. MasterTech automatic operation will cancel.**

*Cause:* The arm is in the Load position or something is preventing the arm from moving.

*Action:* Make sure that the arm is not in the load position or that nothing is preventing the arm from moving.

**6043- (Unit n - S/N: nnnn) Not present.**

*Cause A:* The MasterTech has been turned off.

*Action A:* Check the power connection and make sure the POWER ON/OFF switch on the MasterTech is in the ON (1) position.

*Cause B:* The MasterTech is not properly connected to the SediGraph.

*Action B:* Check the control cable from the MasterTech to ensure that it is properly connected.

**6044- (Unit n - S/N: nnnn) Turntable not present.**

*Cause:* The turntable is not properly installed on the MasterTech.

*Action:* Install the turntable as described in the Installation Manual.

**6045- (Unit n - S/N: nnnn) Turntable not present. MasterTech automatic operation will cancel.**

*Cause:* The turntable is not properly installed on the MasterTech.

*Action:* Install the turntable as described in Installation Manual.

**6046- (Unit n - S/N: nnnn) Arm assembly at the load position.**

*Cause:* You tried to perform an operation that is inoperable when the arm is in the Load position.

*Action:* Press the front panel switch to take the arm out of the Load position.

**6047- (Unit n - S/N: nnnn) Arm assembly at the load position. MasterTech automatic operation will cancel.**

*Cause:* You tried to perform an operation that is inoperable when the arm is in the Load position.

*Action:* Press the front panel switch to take the arm out of the Load position.

**6048- (Unit n - S/N: nnnn) Cannot find position 1 on the turntable.**

*Cause:* The turntable may not be seated properly. If the turntable is moving properly, a service problem may be indicated.

*Action:* Contact your Micromeritics service representative.

**6049- (Unit n - S/N: nnnn) No beaker is present in position (n).**

*Cause:* You requested an action, such as a MasterTech rinse, but there is no beaker present in the specified position.

*Action:* Insert a beaker at the specified position and restart the operation.

**6050- (Unit n - S/N: nnnn) No beaker is present in position (n). MasterTech automatic operation will cancel.**

*Cause:* You requested an action, such as a MasterTech rinse, but there is no beaker present in the specified position.

*Action:* Insert a beaker at the specified position and restart the operation.

**6051- Conversion has not finished, close anyway?**

*Cause:* You tried to close the conversion status window before the conversion of all files was complete.

*Action:* Click **Yes** to cancel the conversion. Click **No** to allow conversion of all files to finish.

**6052- Cannot read source file (file name).**

*Cause:* You tried to convert a non-Windows sample file, but the file could not be read from the disk drive.

*Action:* The conversion of other files will continue; however, the specified file may be invalid. If this error occurs on multiple files, the disk drive containing the files may have failed.

**6053- Destination file (file name) already exists.**

*Cause:* You tried to convert a sample file with the same name as an existing file.

*Action:* Delete the original destination file and repeat the conversion operation.

**6054- Unable to create destination file (file name).**

*Cause:* You tried to convert a non-Windows file, but the output file cannot be created.

*Action:* The disk on which the converted file is to be stored may be full or may have failed.

**6055- Unable to load the Liquid Properties for file (file name). Defaults will be used.**

*Cause:* You tried to convert a non-Windows file, but the liquid properties could not be located.

*Action:* The conversion will continue using the default liquid properties. The converted data will be valid and usable. To conduct the conversion without warnings, ensure that the specified file is located in the 'System Directory' specified on the File Conversion dialog and repeat the conversion.

**6056- Unable to load the Particle Size table for file (file name). Defaults will be used.**

*Cause:* You tried to convert a non-Windows file, but the user-defined report table could not be located.

*Action:* The conversion will continue using the defaults report table. The converted data will be valid and usable. To conduct the conversion without warnings, ensure that the specified file is located in the 'System Directory' specified on the File Conversion dialog and repeat the conversion.

**6057- Conversion aborted. Unrecoverable error converting (file name) into (file name).**

*Cause:* An error occurred when you tried to convert a non-Windows file to the Windows format.

*Action:* The file cannot be converted. Contact your Micromeritics service representative.

**6058- At least one item must be selected for recording.**

*Cause:* The Start Recording Service Test step requires that at least one signal be selected for recording.

*Action:* Select a signal or click **Cancel**.

**6059- An incompatible table with that name already exists.**

*Cause:* In a Service Test script, data collected have names, each of which must be unique.

*Action:* Specify a different name for the data.

**6060- Unable to read the calibration file (file name).**

*Cause:* The calibration file selected for loading is not valid or cannot be read.

*Action:* Confirm the media containing the alleged calibration file has no problems.

**6061- 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 alleged calibration file has no problems.

*Action B:* Choose an alternate media to Save the calibration data.

**6062- The instrument (unit number) is not calibrated.**

*Cause:* Calibration information for various analyzer components are missing.

*Action:* Run the application setup program and reinstall calibration information for the specified unit.

**6063- File cannot be opened for writing. It is already in use.**

*Cause:* A file Save As operation failed because the specified file is already in use.

*Action:* Specify a different file.

**6064- The sample file [name] is not in a valid state to resume the analysis.**

*Cause:* The status of the sample file has changed since you last used it; it can no longer be used as part of an analysis.

*Action:* Select a new sample file, and restart the analysis.



**6065- You need to choose a sample file.**

*Cause:* You selected **OK** on a schedule entry dialog, but you did not select a sample file.

*Action:* Click **Browse** and select a sample file.

**6066- There is no more room for another test in this sample.**

*Cause:* You selected a sample file for analysis that already contains eight tests.

*Action:* Select a different sample file, or delete one of the previous tests from the file.

**6067- The current baseline does not match the one already in the sample.**

*Cause:* You selected a sample file that contains some analyses that were performed using a different baseline.

*Action:* Select a sample file that either has no tests, or has tests that were performed using the current baseline.

**6068- The previous tests of this sample were run on a different SediGraph.**

*Cause:* You selected a sample file that contains some analyses that were performed using a different SediGraph.

*Action:* Either perform the new analysis on the same SediGraph, or select a different sample file.

**6069- The sample has an invalid status and cannot be used for this analysis.**

*Cause:* You selected a sample file that cannot be analyzed.

*Action:* Select a file that has a status of *No Analysis* or *Complete*.

**6070- Unit n - S/N: nnnn There is no baseline available for this unit.**

*Cause:* No baseline has been measured for this unit.

*Action:* Measure a baseline before performing sample analyses.

**6071- Configured serial number does not match instrument.**

*Cause:* The serial number stored in the analyzer does not match the serial number stored with the software.

*Action:* Contact your Micromeritics service representative.

**6072- Could not update the Liquid Properties file (file name). It is currently in use.**

*Cause:* You selected **Change** on the Material Properties dialog to change a liquid properties set. The selected properties cannot be updated because it is being edited.

*Action:* Close the editing session for the named Liquid Properties and try again.

**6073- Could not create the new Liquid Properties file (file name). Properties were not saved.**

*Cause:* You selected **Add** for a liquid properties set on the Material Properties dialog. The new properties set cannot be created.

*Action:* The disk drive on which the liquid properties are stored may be full or may have malfunctioned.

**6074- Could not delete the Liquid Properties file (file name). It is currently in use.**

*Cause:* You selected **Delete** for a liquid properties set on the Material Properties dialog. The selected properties set cannot be deleted because it is being edited.

*Action:* Close the editing dialog and try again.

**6075- New data reduction options are currently being applied to the test data. Do you wish to cancel the reprocessing?**

*Cause:* You elected to change the material properties for a completed sample. These changes are currently being applied to all of the data collected for that sample.

*Action:* Click **Yes** to cancel the changes. Click **No** and the computation will continue.

**6076- Application of new data reduction options to (file name) is complete.**

*Cause:* You requested a change for the material properties on a completed sample file. These changes have been applied to all of the data collected for the sample.

*Action:* Click **OK** to acknowledge the message. Click **Save** if the results are as expected and you wish to save them.

**6077- All of the test data will be converted to the new data reduction options. Do you wish to continue?**

*Cause:* You requested a change to the material properties for a completed sample file. These changes are about to be applied to all of the data collected for that sample.

*Action:* Click **No** to cancel the changes. Click **Yes** and the computation will continue.

**6078- The current hardware does not match the calibration.**

*Cause:* One or more calibrated components have been replaced in the analyzer.

*Action:* Contact your Micromeritics service representative.

**6079- The Schedule contains duplicate beaker entries. Are you sure you want to continue?**

*Cause:* You selected **Start** on the MasterTech Schedule dialog, and there is more than one entry in the schedule that has the same beaker number.

*Action:* Click **No** to stop the operation and fix the schedule. Click **Yes** to continue with the schedule.

**6080- Cell nominal temperature value not in the expected range of (nnn.nn).**

*Cause:* During temperature calibration, the value read is outside of the expected range.

*Action:* Confirm that the correct temperature calibration resistor is being used.

**6081- Error computing particle sizes! The baseline or the fullscale was zero.**

*Cause:* Due to insufficient or inadequate analysis results, an error occurred while converting the raw data collected by the instrument into a particle size distribution.

*Action A:* The data from this analysis cannot be used. The analysis may be deleted from the sample file.

**6082- Mixing chamber nominal temperature value not in the expected range of (n) to (n).**

*Cause:* During temperature calibration, the value read is outside of the expected range.

*Action:* Confirm that the correct temperature calibration resistor is being used.

**6083 (Data Reduction) Zero denominator in mass computation.**

*Cause:* Due to insufficient or inadequate analysis results, an error occurred while converting the raw data collected by the instrument into a particle size distribution.

*Action:* The data from this analysis cannot be used. The analysis may be deleted from the sample file.

**6084- (Data Reduction) Less than 11 data points collected.**

*Cause:* Due to insufficient or inadequate analysis results, an error occurred while converting the raw data collected by the instrument into a particle size distribution.

*Action:* The data from this analysis cannot be used. The analysis may be deleted from the sample file.

**6085- (Data Reduction) Computed a particle size of zero.**

*Cause:* The material properties specified for this sample result in a particle size computation which is less than or equal to zero.

*Action:* The data from this analysis will not be converted into a particle size distribution. Edit the material properties for the sample and modify them so they are valid. Click **Update Properties** on the Material Properties dialog to reprocess the analysis results.

**6086- (Data Reduction) Insufficient data for mass filter.**

*Cause:* Due to insufficient or inadequate analysis results, an error occurred while converting the raw data collected by the instrument into a particle size distribution.

*Action:* The data from this analysis cannot be used. The analysis may be deleted from the sample file.

**6087- The Coarse/Fine specification file is invalid. No results available.**

*Cause:* You requested an invalid file for, or forgot to specify, either the coarse or fine specification.

*Action:* If no specification files have been specified, select them from the Report Options dialog and re-run the report. If files have been specified, ensure that they contain valid data.

**6088- The cell temperature reading of (nnn.nn) is invalid. If an analysis is in progress you may choose to cancel it.**

*Cause:* A temperature reading outside of the valid range has occurred.

*Action:* If the problem persists, contact your Micromeritics service representative.

**6089- The mixing chamber temperature reading of (nnn.nn) is invalid. If an analysis is in progress you may choose to cancel it.**

*Cause:* A temperature reading outside of the valid range has occurred.

*Action:* If the problem persists, contact your Micromeritics service representative.

**6090- The sample is already scheduled to be used for another analysis.**

*Cause:* You have requested a sample file for an analysis that is already scheduled in the MasterTech schedule or the Repeat schedule.

*Action A:* Select a different sample that is not scheduled in the MasterTech schedule or the Repeat schedule.

*Action B:* Remove the sample from where it is already scheduled and then try again.

## **B      SAMPLE DISPERSION**





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## SAMPLE DISPERSION

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Use of the SediGraph requires that each powder be well dispersed in a liquid of known density and viscosity and that the difference between the powder and liquid densities be accurately known. Viscosity and density data for some common liquids are given in Appendix G. Handbook values for other liquids are usually sufficiently accurate, so the latter requirement means that only the powder density must be determined if it is unknown and if composition information does not permit calculation from handbook values. For this, one of Micromeritics' pycnometers is recommended. For materials likely to have dead-end pores into which liquid may not completely penetrate, the effective density\* may need to be determined using the sedimentation liquid to be employed and a gas pycnometer.

The liquid should be one in which the powder can be completely dispersed (separated into unattached particles) for accurate size results to be obtained. Obviously, the liquid should be nontoxic, readily available, and one in which the sample is insoluble. Complete insolubility may be difficult to achieve in some instances. Solubility problems may be minimized by allowing the liquid to stand in contact with the particle material prior to using the liquid for the test sample. This cannot completely eliminate problems, however, because particle solubility is a function of particle size. Small particles are more soluble than large ones; in a dispersion of different sizes, the smallest particles tend to go into solution while precipitation occurs on the larger particles. In making a particle size distribution analysis, particle solubility is indicated if the recorded distribution consistently fails to attain zero percent even long after the analysis is complete.

There are no established rules or laws by which complete particle dispersion can be assured. Only guidelines can be offered. Some powders disperse easily in any of several liquids and remain so while others require careful attention to conditions in order to achieve dispersion and are prone to reaggregate if conditions shift a small amount. A few can be dispersed only after extended treatments.

Agitation, resulting in the application of strong shear forces, aids dispersion. The more violent the agitation, perhaps carried out in a high-speed blender, homogenizer, or an ultrasonic device, the better generally is the dispersion. Stirring a suspension while subjecting it to ultrasonic dispersion generally achieves the best dispersion because this ensures that all portions of the mix are brought into the zones of greatest energy.

For a few friable materials such agitation can result in comminution of the particles for which measurements are desired. This is not likely to be the case with solid particles, particularly when the particles are under 50 to 100  $\mu\text{m}$  in diameter.

Air bubbles cause misleading results if trapped in the liquid during agitation. Care should be taken to avoid bubble entrapment, especially when the liquid is highly viscous. The SediGraph performs bubble elimination routines and checks to verify their effectiveness, but the best agitation procedure is one that does not introduce them in the first place.

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\*The procedure for determining the effective density is discussed in Application Note #94. Contact your local sales representative or the Micromeritics sales office to request a copy.

The magnetic stirrer built into the instrument is a convenient means for maintaining a homogeneous particle dispersion but will cause flocculation in certain magnetically susceptible materials. With such particles, stirring can be accomplished by using the ultrasonic dispersion accessory or the MasterTech (refer to “[Ordering Information](#)” on page 10-3, for part numbers).

Chemical wetting or dispersing agents also generally aid dispersion. A great variety of such products are marketed. Appendices C and H list some of the more useful dispersing aids, as well as sources for some of these materials. These agents have been found useful for particle dispersion in Micromeritics' Materials Analysis Laboratory but are not the only agents available. It is to be noted that liquid density and viscosity values may need slight adjustment if more than about 0.1% by weight (based on the dry weight of the sample) of dispersing agent is added and precise measurements are desired.

Some commercial surfactants are intended for use in specific pH ranges and in particular nonaqueous solutions. Slight solution composition differences may alter the effectiveness of any agent. The chemical supplier should be contacted about this type of problem. Sometimes merely shifting the pH of an aqueous dispersion will yield great improvements in the degree of dispersion. Metal oxides and metals that are likely to have oxide layers on their surface ordinarily are most easily dispersed in mildly alkaline media. Metal powders with any likelihood of grease on them should always be degreased prior to a dispersion attempt. Noble metal powders usually need a wetting agent for good dispersion. Dispersions involving hydrocarbon liquids that are immiscible with water are often difficult to make unless the powder is quite dry. Sometimes moisture picked up from the air is more than enough to cause difficulties.

Micromeritics offers Sedisperse<sup>®</sup> liquids in three series for dispersing particles at low solids concentrations. A- and P-series are stable, balanced formulations containing highly purified, saturated aliphatic hydrocarbons and added surfactants. A-series Sedisperse liquids are colorless while the P-series are pale yellow. These liquids produce nearly universal dispersion of powder-liquid systems with solids concentrations below three weight percent generally, and as much as five weight percent in some cases. Sedisperse liquids solubilize adsorbed moisture.

W-series Sedisperse liquids are slightly anionic, non-foaming, aqueous formulations. They also produce nearly universal dispersion of systems with concentrations generally below three weight percent. Sedisperse liquids contain built-in surfactants and dispersants so that nothing else needs to be added for the dispersion of particles except mechanical and/or ultrasonic energy. These liquids are available over a range of densities and viscosities, thus making them applicable to particles of widely varying properties. Sedisperse liquids are designed to be used without dilution or the addition of surfactants, and exhibit good shelf life and stability. A data sheet is supplied with each liquid giving handling details, density, and viscosity data over a temperature range of 24 to 45 °C.

The A-series Sedisperse liquids are the most widely useful and will disperse most powders, including metals, oxides, silicates, pigments, Portland cements, propellants, and many other powders. Those few materials not dispersing well in the A-series liquids can usually be dispersed in the P-series Sedisperse liquids. These are special formulations, slightly cationic, developed to disperse difficult metal and pigmented resin powders. The W-series Sedisperse liquids should be used to disperse those materials which are soluble in the organic Sedisperse liquids. See Appendix I for detailed information on Sedisperse liquids.

Some powders flocculate upon standing a few moments after having been dispersed. Such flocculation is quite readily detected with the SediGraph. The indicated size distribution as plotted by the instrument during a test will proceed normally until flocculation starts. The first evidence of flocculation will likely be an increase in the indicated particle concentration and this will then be followed by a precipitous drop in

the plotted percentage. Flocculation, of course, prevents accurate particle size analysis, and better dispersion and stabilization techniques must be sought.

As a general guide, the best dispersing technique (includes agent and procedure) is the one producing consistently the finest distribution of sizes by SediGraph analysis. We make this assertion because of the high reproducibility of the SediGraph when presented identical samples. If the sample preparation technique is deficient in freeing particles one from another or if, though unlikely, is producing particle fracture, this will be evidenced by an inconsistency of results.

The rheological behavior of high concentrations of fine powder in a liquid gives a good preliminary indication of the suitability of both the liquid medium and the dispersing agent. Some powders containing as much as 50 percent liquid act as if they were almost a solid mass, but a few tenths of a percent of wetting agent can cause the mass to take on the consistency of soup. This reaction is indicative of a very good agent. The effect will not often be so dramatic, but working the mass with a spatula will give a good indication of the efficacy of an agent.

A test for the optimum quantity of a dispersing agent is conducted by measuring the sediment volume from a slurry of about 5 weight percent concentration. The slurry and agent must be mixed and allowed to stand in a sedimentation tube undisturbed by either mechanical vibrations or thermal currents. The minimum sediment volume indicates the best agent concentration level. If several dispersing agents are compared at the same time, the minimum sediment volume is also a measure of the best dispersing agent.

No particular sample concentration is required in using the SediGraph as long as the dispersed sample reduces the radiation beam intensity by 13 to 70 percent. The recommended procedure for initial testing is to prepare a dispersion of approximately 5 volume percent concentration. Portions of this preparation are added to pure suspending liquid until an adequate concentration for analysis is achieved. The advantage of this procedure is that less concentrated dispersions can generally be produced without fear of flocculation once the initial preparation is made.



# **C      CHEMICAL AIDS FOR PARTICLE DISPERSION**



## CHEMICAL AIDS FOR PARTICLE DISPERSION

Name	Type	Active Ingredient
Aerosol 22	Anionic	Tetrasodium N-(1,2-dicarboxyethyl)-N-octadecylsulfosuccinate, 35%
Aerosol OT	Anionic	Diocetyl ester of sodium sulfosuccinic acid, 70%
Atlas G-3300	Anionic	Amine salt of alkylaryl sulfonate
Calcium Chloride	Cationic	CaCl <sub>2</sub>
Calgon	Anionic	Sodium hexametaphosphate, unadjusted
Calgon T	Anionic	Part of sodium replaced by other cations, predominantly zinc
Cobaltous Chloride	Cationic	CoCl <sub>2</sub>
Cobalt Citrate	Anionic	Co <sub>3</sub> (C <sub>6</sub> H <sub>5</sub> O <sub>7</sub> ) <sub>2</sub>
Daxad 23	Anionic	Sodium salts of polymerized substituted benzoid alkyl sulfonic acid (alkyl, long chain), 84.5%
Daxad 30	Anionic	Sodium salt of polymerized carboxylic acid, 25%
FC-134	Cationic	Fluorochemical surfactant
FC-161	Anionic	Fluorochemical surfactant
FC-170	Nonionic	Fluorochemical surfactant
Igepal CO-530	Nonionic	Nonylphenoxypoly (ethyleneoxy) ethanol, 100%
Oleic Acid	Anionic	CH <sub>3</sub> (CH <sub>2</sub> ) <sub>7</sub> CH=CH (CH <sub>2</sub> ) <sub>7</sub> COOH
Renex 648	Nonionic	Ethoxylated nonylphenol, 100%
Sodium Silicate	Anionic	Na <sub>2</sub> SiO <sub>3</sub>
Triton X-100	Nonionic	Octyl phenoxy polyethoxy ethanol, 100%
Tamol SN	Anionic	Sodium salt of condensed naphthalene sulfonic acid, 100%
TSPOP	Anionic	Tetrasodiumpyrophosphate, Na <sub>4</sub> P <sub>2</sub> O <sub>7</sub>
Twitchell Base 8240	Anionic	Sodium salt of low molecular weight, sulfonated oil, paraffin oil, water, and diethylene glycol

<b>Name</b>	<b>Type</b>	<b>Active Ingredient</b>
Tween 20	Nonionic	Polyoxyethylene Sorbitan monolaureate (polysorbate 20), 100%
Zonyl S-13	Anionic	Fluoroalkyl phosphate
Zonyl A	Nonionic	Ethylene oxide-ester condensate

Data extracted from McCutcheon's Detergents and Emulsifiers, McCutcheon Division, MC Publishing Co., Glen Rock, NJ, 1980.



## **D STOKES' LAW**



## STOKES' LAW

A particle falling due to gravity in a viscous liquid is acted upon by three forces: a gravitational force acting downward, a buoyant force acting upward, and a drag force acting upward. The descriptive equation of this motion is

$$mg - m_o g - F_D = m_o \frac{dv}{dt} \quad (1)$$

where  $m$  is the mass of the particle,  $m_o$  the mass of a volume of liquid equal to the volume of the particle,  $g$  the acceleration of gravity,  $F_D$  the drag force,  $v$  the particle velocity, and  $t$  the time.

Small particles reach a stable, or terminal, velocity very rapidly; hence,  $dv/dt$  quickly becomes zero. The equation of motion for a sphere of diameter  $D$  and density  $\rho$  falling in a liquid of density  $\rho_o$  then becomes

$$F_D = \frac{\pi}{6}(\rho - \rho_o)gD^3 \quad (2)$$

Dimensional analysis reveals that stable particle motion through a liquid is governed by two dimensionless groups: the particle Reynolds number  $Re$

$$Re = Dv \frac{\rho_o}{\eta} \quad (3)$$

where  $\eta$  is the liquid viscosity, and a drag coefficient  $C_D$  expressed by

$$C_D = \frac{(\text{drag force})}{(\text{cross-sectional area of particle})(\text{dynamic pressure on particle})} = \frac{F_D}{\frac{\pi D^2}{4} \times \frac{\rho_o v^2}{2}} \quad (4)$$

The relationship between  $Re$  and  $C_D$  for laminar (not turbulent) flow conditions is well established experimentally for low values of the Reynolds number to be

$$C_D = \frac{24}{Re} \quad (5)$$

Combining equations (2) through (5) yields

$$D^2 = \frac{18v\eta}{(\rho - \rho_0)g} \quad (6)$$

which has come to be identified as the Stokes law equation\*.

\* Stokes, G.G., *Mathematical and Physical Paper III*, Cambridge University Press, 1891.

# E SEDIMENTATION THEORY

Calculations	E-3
Method of Analysis	E-6



## SEDIMENTATION THEORY

### Calculations

Sedimentation size analysis is based upon the fact that the measured equilibrium velocity of a particle through a viscous medium, resulting from the action of the gravitational force, can be related to the size of the particle by Stokes' law. For spherical particles, Stokes' law is expressed by

$$D = Kv^{1/2} \quad (1)$$

where

$$K = \left[ 18 \frac{\eta}{(\rho - \rho_0)g} \right]^{1/2} \quad (2)$$

and  $D$  is the diameter of the spherical particle,  $v$  its equilibrium sedimentation velocity, and  $\rho$  its density. The fluid medium is characterized by viscosity  $\eta$  and density  $\rho_0$ ;  $g$  is the acceleration of gravity. These equations apply rigorously as long as the particle Reynolds number,  $Dv\rho/\eta$ , is less than 0.3 and they apply up to a Reynolds number of 0.5, with about 3% error.\*

In practice, truly spherical particles are seldom encountered, and Stokes' law is not exact for any other shape. Since irregular shapes cannot in any case be described by a single linear dimension, it is accepted practice to specify the size of non-spherical particles in terms of the diameter of a sphere of the same material that would have the same sedimentation velocity. Thus, for non-spherical particles, the terms "Stokes' diameter" or "equivalent spherical diameter" are universally understood. The term "equivalent spherical diameter" (E.S.D.) is sometimes used in a different context to mean the diameter of a sphere of the same material that would have the same mass as the particle in question; that is, the results of measurements of particle dimensions from electron micrographs are frequently reduced to size distribution curves in terms of mass E.S.D. In general, the relationship between these two measures of size is given by the inequality

$$\frac{\text{Sedimentation E.S.D.}}{\text{Mass E.S.D.}} \leq 1 \quad (3)$$

The ratio expressed in equation (3) is usually close to unity.

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\*Lapple, C.E., et al, *Fluid and Particle Mechanics*, University of Delaware, Newark, 1956.

Data on the sedimentation velocity of suspended particles may be obtained in two ways: (a) by measuring the concentration of particles remaining in suspension as a function of time, or (b) by measuring the quantity of sediment produced as a function of time. The latter approach is less desirable mathematically because of the graphical differentiation required to reduce the data to a size distribution curve.

Tests based on the first approach are traditionally performed in the following way. A dilute, dispersion of the fine particle material is stirred to render it homogeneous and then allowed to stand undisturbed while undergoing sedimentation. Time is measured from the beginning of the settling period. By Stokes' law, a particle of diameter  $D$  will settle a distance  $h$  in time  $t$  according to the expression

$$D = K \left( \frac{h}{t} \right)^{1/2} \quad (4)$$

where  $K$  is given by equation (2). Consequently, after a given time  $t_i$  all particles larger than the corresponding diameter  $D_i$  will have fallen below a given distance  $h$  from the surface of the suspension. If the initial (uniform) concentration of material is  $C_o$  g/cm<sup>3</sup> and the concentration after time  $t_i$  at distance  $h$  is  $C_i$  g/cm<sup>3</sup>, then  $P_i$ , the weight percent of material finer than  $D_i$ , is given by

$$P_i = 100 \left( \frac{C_i}{C_o} \right) \quad (5)$$

By obtaining values of  $C_i$  after various times, the corresponding values of  $P_i$  and  $D_i$  may be calculated, which when plotted yield an integral, or cumulative distribution of particle size in terms of Stokes' E.S.D.

The SediGraph uses a finely collimated X-ray beam to measure particle concentration in terms of the transmitted intensity of the X-ray beam through the suspension relative to the clear or particle-free suspending fluid. This transmittance is a function of the weight concentration of the suspended solid at the depth of measurement. Since the X-ray beam can be made extremely small and because it does not disturb the suspension, it constitutes an ideal measuring technique.

If a sample container or cell of rectangular cross section is irradiated from a direction perpendicular to one of its sides by a collimated X-ray beam, the fraction of the incident radiation transmitted by the cell when filled with the suspension under study is given by

$$\frac{I}{I_o} = e^{-(a_1 \phi_1 + a_s \phi_s) L_1 - a_c L_2} \quad (6)$$



where:  $I$  and  $I_0$  are the transmitted and incident intensities;  $a_1$ ,  $a_s$ , and  $a_c$  the X-ray absorption coefficients of the liquid, the particulate solids, and the cell walls, respectively;  $\phi_1$  and  $\phi_s$  the weight fractions of liquid and solid present in the suspension;  $L_1$  the internal cell thickness in the direction of irradiation;  $L_2$  the total thickness of the cell walls. By using the relation  $\phi_1 = 1 - \phi_s$  and by defining a transmittance  $T$  as the ratio of the transmission of the cell when filled with a sample dispersion to its transmission when filled with pure suspending liquid, there is obtained

$$T = e^{-\phi_s(a_s - a_1)L_1} \quad (7)$$

or

$$\ln T = -A\phi_s \quad (8)$$

where  $A$  is a constant for the particular apparatus and suspension components.

By collimating the X-ray beam through horizontal slits with a vertical dimension small compared to the sedimentation depth,  $h$ , the measured values of  $T$  can be used in calculating the particle size distribution; that is,

$$P = 100 \left( \frac{\ln T_i}{\ln T_0} \right) \quad (9)$$

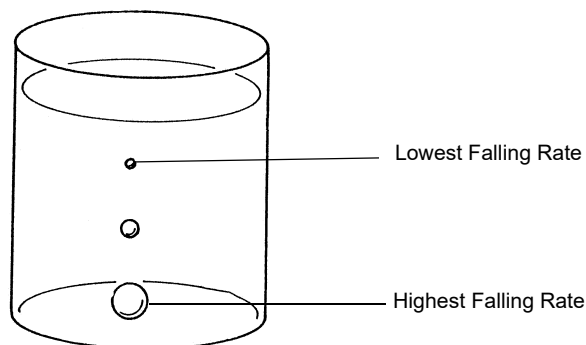
where  $T_0$  refers to the transmittance of the initial suspension.

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## Method of Analysis

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Generally, the sedimentation method derives its results from the rates that different size particles fall in a liquid due to the force of gravity. Rate, as used here, is the distance that a particle falls in a certain period of time. The scientific law which describes the rate that particles fall in a liquid is called Stokes' Law. Large particles fall at a faster rate than smaller particles, as shown in the following illustration.



**Figure E-1. Particle Size Analysis Using Sedimentation**

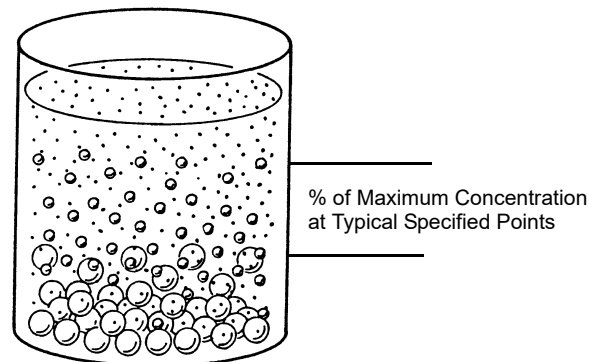
In order to determine particle diameters accurately using the falling rates of particles, the density and viscosity of the liquid used must be known as well as the density of the particles. Density is the mass of a material that it takes to fill a unit of space. Viscosity may be thought of as the resistance of the liquid applied to falling particles. For example, a particle falls much slower in syrup than in water because syrup has a higher viscosity. It should also be noted that temperature affects both the density and viscosity of liquids; therefore, the temperature of the liquid must be known for particle size determinations to be accurate.

The falling rates for various particle sizes are computed before analysis using Stokes' Law. A vertical distance and an elapsed time are selected for each falling rate such that a particle falling at a certain rate will fall a certain distance in a selected time. Relative particle concentration is then measured at the selected distance and time.

Initially, a completely mixed (homogeneous) suspension of particles is established in a container by rapidly circulating the mixture. The circulation is stopped, and the relative concentrations of particles are measured at the selected vertical distances from the top of the container and at the selected elapsed times after circulation is stopped.

The particle size associated with each concentration measurement is the size of the largest particle present at the height and time of the measurement. All particles larger than that size have higher falling rates, and have fallen to a lower point in the container. Smaller particles are still present at equal concentrations just above and below the specified point. Thus, the concentration measured at the specified point is the concentration of particles smaller than or equal to that size.

This series of relative concentrations of particles smaller than various sizes is the particle size distribution.



**Figure E-2. Particle Size Distribution**

Since different particles usually have different shapes, the standard measure used to report particle size is *Equivalent Spherical Diameter*. This is the diameter of a sphere (or perfectly rounded mass) of the same material with the same falling rate.

## System Operation

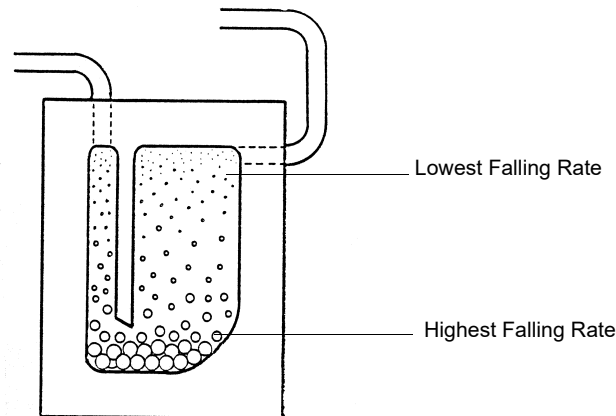
The sedimentation method is used for particle size analysis in the SediGraph. The rates of particle fall due to gravity are calculated and X-ray absorption (concentration) of particles at different heights and points in time are determined, and the results of those determinations are provided as graphs and tabular reports. Sedimentation analysis takes place in the analyzer. Data are sent to the computer which provides the graphs and tabular reports.

The material to be analyzed is dispersed in a liquid, according to the type of analysis to be performed. (For more information concerning the relationship of dispersion to the type of analysis, see appendices B and C.) At the appropriate time, the dispersed mixture is poured into the mixing chamber on the front of the analyzer.

A magnetic stirrer located under the mixing chamber keeps the particles suspended (that is, keeps the particles from sedimenting) until it is time for the analysis. The stirring speed can be adjusted as required to properly suspend the particles. If the particles to be analyzed are attracted to the magnetic stirrer, the magnetic stirrer can be replaced with a mechanical stirrer. If the dispersion energy required to keep the particles in a dispersed state in the mixing chamber is more than can be provided by the stirrer used, an ultrasonic probe can be inserted into the mixing chamber.

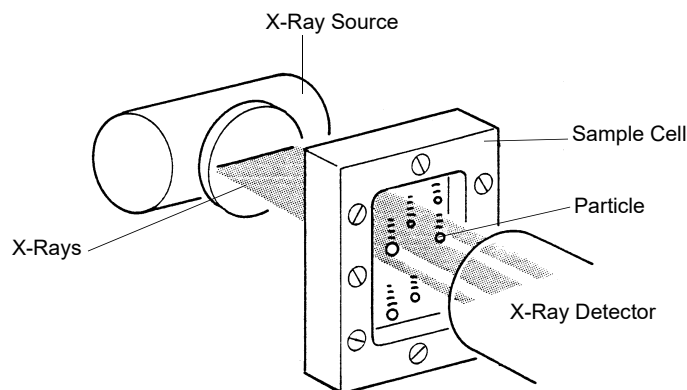
Sedimentation takes place inside an analysis cell as shown in the following illustration. At the appropriate time, the particle mixture is transferred by the analyzer from the mixing chamber to the analysis cell. Particle circulation is stopped, and the particles are allowed to sediment (or

fall) inside the analysis cell under the influence of gravity. The SediGraph then determines the particle size distribution.



**Figure E-3. Analysis Cell**

An X-ray beam (made up of a number of fine parallel rays) is provided from a source inside the analyzer. A unit which detects X-rays is placed directly across from the X-ray source. The analysis cell is placed in the path of the X-ray beam, between the X-ray source and the detector. The cell contains a window on each side so that the X-rays can pass through the cell to the detector. Sedimenting particles (particles falling under the influence of gravity) inside the cell cross the path of the X-ray beam. The particles in the path of the beam absorb X-rays (that is, the particles keep some X-rays from reaching the detector). The amount of X-ray absorption at the point in the cell where the beam is located is determined as a percentage of the X-ray absorption with the highest particle concentration for that sample. Based upon particle falling rates, this percentage is related to the maximum particle size above that point in the cell.



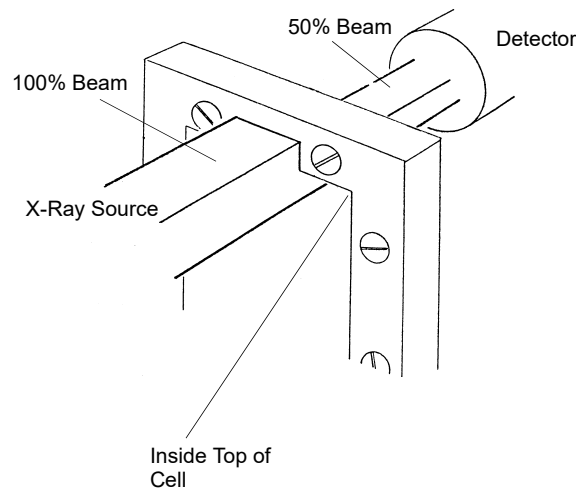
**Figure E-4. SediGraph Particle Size Analysis**

The SediGraph system uses both particle falling rates and the amount of X-ray absorption for particle size analysis. Particle falling rates (according to Stokes' Law) are used to determine the points in the cell beyond which certain size particles have fallen. X-ray absorption is used to determine the percentage of total particle mass at different points in the cell. The resulting particle size distribution data are processed by the system computer and used to provide graphs and tabular reports which provide details of the analysis.

## Particle Falling Rates

Particle falling rates are very significant in the determination of particle size distribution. However, there are several important considerations in the accurate determination of particle falling rates. There must be a reference point for measuring particle falling distances. The SediGraph uses an automatic beam-split feature for establishing a reference point. Small particles have a low falling rate, which could require considerable amounts of time for analysis. The SediGraph uses cell movement during analysis to shorten analysis times by measuring small particle concentration at very short sedimentation distances. Cell movement does not affect particle falling rates within the cell. Particle dispersion also affects falling rates; therefore, proper particle dispersion is required when using the SediGraph.

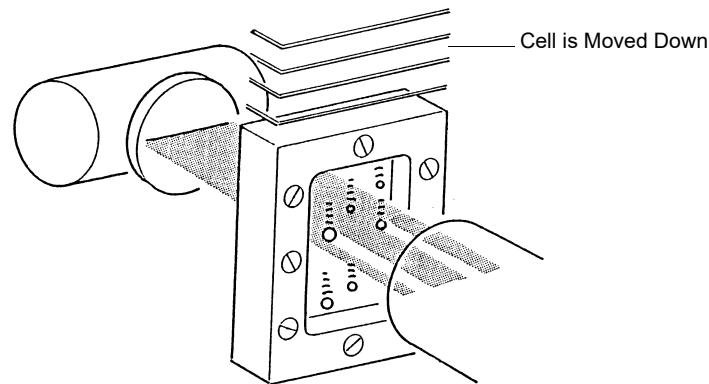
### Beam-Split



**Figure E-5. Beam-Split**

Since the top of the cell is used as the reference point for measuring particle falling rates, the exact position of the cell (relative to the X-ray beam) must be known in order for particle falling rates to be correct. The SediGraph determines the position of the cell by moving the cell to the point where the top edge of the cell splits the X-ray beam (exactly in half), and by storing this beam-split data in the system computer so that this position can be located for the next analysis. Beam-split is done automatically by the system at the start of any automatic scanning operation; no message is displayed on the monitor unless beam-split cannot be performed for some reason.

## Cell Movement

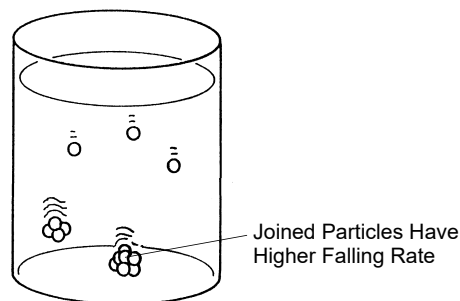


**Figure E-6. Cell Movement**

The cell is attached to an elevator assembly which moves the cell down during analysis to speed the data collection process. The system computer performs the calculations associated with particle falling rates as the distances and times are changed according to the movement of the cell. For example, as shown in the cell movement illustration, it might take 30 minutes for the particle shown to fall the distance from the top of the cell to the X-ray beam; however, by moving the cell down, the particle reaches the beam in, perhaps, three minutes. The system computer uses this time and distance in determining the particle falling rate.

## Particle Dispersion

The particle falling rates also depend upon how well the particles in the cell are dispersed (or separated). Joined particles behave as a single particle with a greater falling rate than if the joined particles were separate (as shown in the following illustration).



**Figure E-7. Affect of Dispersion on Particle Falling Rate**

## X-Ray Absorption

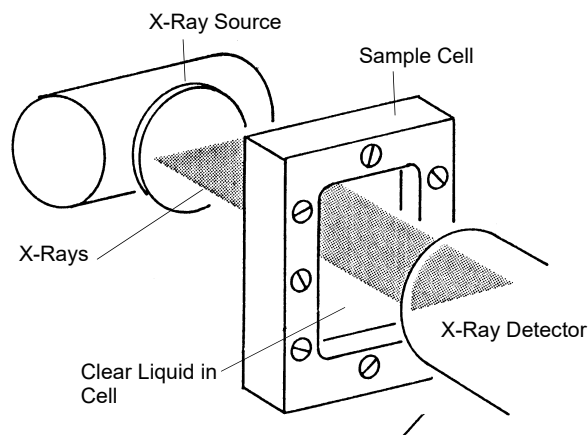
In addition to particle falling rates, the SediGraph uses the relative amount of X-ray absorption as part of the analysis process. As falling particles in the cell cross the path of the X-ray beam, they absorb X-rays. In order for X-ray absorption to be used for measuring the distribution of particle masses in the cell: (1) the minimum and maximum X-ray absorption must be determined for each X-ray absorption measurement point in the cell; (2) any bubbles in the cell must be detected and eliminated; and (3) the particles must be properly dispersed, as explained in Appendices B and C.

### Baseline (Minimum) Absorption

In order for the X-Ray absorption values to be accurate, a reference (or baseline) must be used with each value. This baseline is the amount of X-ray absorption with no particle mass present. However, since the sedimentation liquid also absorbs X-rays, the amount of X-ray absorption for the liquid must be included in the baseline. The shape of the cell, or cell profile, affects the accuracy of baseline X-ray absorption values. The SediGraph automatically determines the baseline and makes baseline corrections for any changes in the shape of the cell. This feature is called baseline correction. Let's look at how it works.

When instructed, the SediGraph performs an X-ray scan of the cell filled only with the selected sedimentation liquid. The reason for this scan is to determine the amount of X-ray absorption of the cell and liquid alone before any particles are introduced. The scan progresses from the bottom of the cell toward the top in exactly the same manner as will be done when sample particles are present.

As the cell is scanned, X-ray absorption reference values (referred to as baseline values) are determined at many points along the cell. The baseline value is the amount of X-ray absorption at that point in the cell. The baseline value is for 0% concentration since the cell contains only the sedimentation liquid and no particles.



**Figure E-8. Baseline (0% Concentration) Absorption**

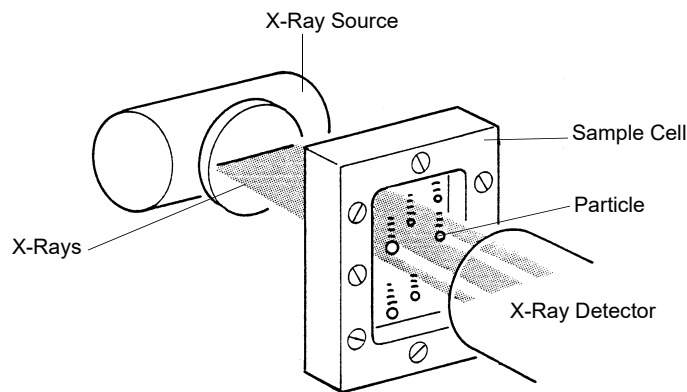
Slight differences in the cell thickness at the measurement points (up to 250) along the cell change the amount of X-ray absorption for those points. The amount of X-ray absorption at

each point is stored in the system computer and recalled during the analysis to adjust the baseline at those same points in the cell.

The baseline values do not change unless the sedimentation liquid changes, the shape of the cell changes, or the X-ray intensity changes. It is, however, recommended that you obtain a baseline measurement at the beginning of each shift or whenever a different dispersant (or a new batch) is to be used. This assures accurate analysis results. The baseline operation is selected from the Unit [n] menu.

### **Full-Scale (Maximum) Absorption**

Before each analysis, the SediGraph examines the cell filled with particles suspended in liquid (particles not allowed to sediment). As the cell is being examined, a full-scale X-ray absorption value (or maximum absorption) is determined for each point along the cell as shown in the following illustration. This full-scale absorption value is for 100% concentration, since the cell contains suspended particles, which represents the highest particle concentration for that analysis. The full-scale absorption values change with each analysis since a different number and composition of particles is used.



**Figure E-9. Full-Scale (Maximum) Absorption**

The X-ray absorption is measured at up to 250 positions in the cell. This may be reported on the Baseline/Full scale report. The full scale scan used in the analysis is computed as the average of 10 readings measured at a fixed position.

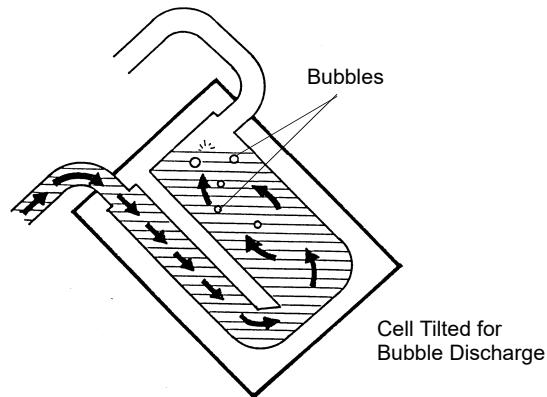
The full-scale absorption profile operation is performed automatically by the system. Since baseline absorption and full-scale absorption are known for each analysis point in the cell before the analysis, the absorption during the analysis is a percentage somewhere between baseline and full-scale. Using particle falling rate determinations, the system determines the size of the particles which have fallen beyond the specific analysis point in the cell. Therefore, the absorption percentage at each specific analysis point in the cell indicates the percentage of particles that are below a certain particle size. When this is done for a number of points in the cell, the particle size distribution can be determined.



## Bubble Detection/Elimination

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If air bubbles are formed in the cell during analysis, the amount of X-ray absorption at those points will be detected as a sharp, discrete change. This would make the analysis results invalid. In order to prevent this, the SediGraph has a built-in bubble detection and elimination feature. This feature automatically detects and removes bubbles from the cell. A message is displayed on the screen indicating this operation is in process.



*Figure E-10. Bubble Detection/Elimination*



# **F SEDIGRAPH RESULTS RELATIVE TO OTHER METHODS**



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## SEDIGRAPH RESULTS RELATIVE TO OTHER METHODS

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The SediGraph 5100 Analyzer, sieve analysis, and hydrometer measurements yield particle size distributions on a mass (weight) basis. Microscopic measurements result in size data as a function of the number of particles. Measurements that involve light scattering, transmission, or diffraction relate size most appropriately to particle cross sectional area. Particle counting systems, electric zone sensing, gives size in terms of particle volume.

Mass-based measurements can be expected to be in agreement with respect to their reliability and the applicability to the size range involved, provided the particles are spherical and solid. When the particles are irregular, close agreement should not necessarily be anticipated. Sieve analysis, for example, must be very carefully performed with fine particles to ensure complete separation according to size without damaging the sieves. Even so, the size determined is not necessarily the same as that measured by the SediGraph. The SediGraph determines the size of all particles in terms of the E.S.D. (equivalent spherical diameter). Since sieve openings are usually square, elongated particles sometimes pass a given sieve in one orientation and at other times are retained. These differences obviously lead to differences in results.

Light-based instruments incorporate various means for tuning, calibrating, and data reduction, which can make them agree satisfactorily for some materials with most any one of the other techniques. Any setting is dependent to a degree on the refractive index of the measured particles, however, so agreement cannot be general or over all particle size ranges. The shape of the particles also influences all results.

Mass and volume measurements are equivalent numerically. Therefore, analyses with the SediGraph and the electric sensing zone can be expected to agree if the particles are spherical, solid, and if their size range is sufficiently narrow for all of them to be accurately detected by the electric sensing zone. Again, precise agreement is not to be expected with irregular particles, for the electric sensing zone measures something closely akin to the diameter an irregular particle would assume were it melted into a sphere. This is not necessarily the equivalent spherical diameter.

Microscopic measurements yield particle diameters that, for spheres, are essentially E.S.D. As before, measured sizes will deviate from E.S.D. when the particles are irregular— the greater the irregularity, the greater the deviation. The numbers will not correspond even approximately because, as noted above, the measurements are on a different basis. However number-based measurements are readily converted into mass-based (or volume-based) results by applying the relationship to incremental sizes,

$$Y = \frac{nD^3}{\Sigma(nD^3)}$$

where Y is the mass percent of particles having the diameter D and n the number of particles of that diameter. The denominator, therefore, represents the entire spectrum of sizes. The following tabulation presents number-based data and calculations leading to the number-based and mass-based diameter distributions.

*Comparison of Number and Mass (volume) Size Distributions*

Particle Diameter Range ( $\mu\text{m}$ )	D Largest Diameter Within Range ( $\mu\text{m}$ )	n Number of Particles Within Range	Percent By Number Less Than Diameter	$nD^3$	$\frac{nD^3}{\Sigma(nD^3)}$	Percent by Mass Less Than Diameter
5.4 - 5.0	5.4	10	100.0	1575	0.0481	100.0
4.9 - 4.5	4.9	51	99.2	6000	0.1833	95.2
4.4 - 4.0	4.4	65	95.3	5537	0.1692	76.9
3.9 - 3.5	3.9	70	90.3	4152	0.1269	59.9
3.4 - 3.0	3.4	133	84.9	5227	0.1597	47.3
2.9 - 2.5	2.9	160	74.6	3902	0.1192	31.3
2.4 - 2.0	2.4	288	62.3	3981	0.1216	19.4
1.9 - 1.5	1.0	271	40.1	1859	0.0568	7.2
1.4 - 1.0	1.4	162	19.2	445	0.0136	1.5
0.9 - 0.5	0.9	72	6.7	52	0.0016	0.2
0.4 - 0	0.4	<u>14</u>	1.1	<u>1</u>	0.0000	0.0
		1296 = $\Sigma n$		32731 = $\Sigma nD^3$		

# **G LIQUID DENSITY AND VISCOSITY DATA**





## LIQUID DENSITY AND VISCOSITY DATA

Density and viscosity of pure liquids and solutions (aqueous, by weight) as functions of temperature at atmospheric pressure.

Liquid or Solution	Temperature (°C)	Density (g/cm <sup>3</sup> )	Viscosity (mPa·s)
Ethanol (absolute)	25	0.7851	1.096
	30	0.7808	1.003
	35	0.7764	0.914
Ethylene Glycol	25	1.1100	16.10
	32	1.1051	12.18
	40	1.0995	9.13
Glycerol (10%)	25	1.0206	1.1530
	30	1.0192	1.0240
	35	1.0178	0.9150
Glycerol (20%)	25	1.0452	1.5430
	30	1.0436	1.3590
	36	1.0400	1.1743
Glycerol (40%)	25	1.0970	3.1860
	30	1.0948	2.7280
	35	1.0926	2.3400
Glycerol (50%)	25	1.1238	5.041
	30	1.1211	4.247
	35	1.1182	3.540
Hexane (n)	25	0.6550	0.3046
	30	0.6504	0.2900
	35	0.6459	0.2828
Isopropanol	30	0.7769	1.7800
	32	0.7752	1.6800
	35	0.7728	1.5400
Sucrose (20%)	20	1.0810	1.945
	30	1.0777	1.493
	40	1.0737	1.184
Sucrose (30%)	20	1.1270	3.187
	30	1.1232	2.373
	40	1.1189	1.833

Liquid or Solution	Temperature (°C)	Density (g/cm <sup>3</sup> )	Viscosity (mPa·s)
Sucrose (40%)	20	1.1765	6.167
	30	1.1721	4.375
	40	1.1676	3.241
Sucrose (50%)	20	1.2296	15.43
	30	1.2250	10.11
	40	1.2200	6.991
Water	26	0.9968	0.8737
	32	0.9951	0.7679
	38	0.9930	0.6814
<i>n</i> -Butanol	25	0.8058	2.59
	32	0.8003	2.18
	40	0.7940	1.78

Data extracted from (with interpolation in some cases):

Honig, P., *Principles of Sugar Technology*, p. 31, Elsevier Publishing Co., New York, 1953.

Swindells, J.F., Snyder, C.F., Hardy, R.C. and Golden, P.E., *Viscosities of Sucrose Solutions at Various Temperatures: Tables of Recalculated Values*, Supplement to N.B.S. Circular 440, U.S. Government Printing Office, Washington, 1958.

*CRC Handbook of Chemistry and Physics*, 59th Edition, The Chemical Rubber Co., Cleveland, OH, 1978-79.

*The Merck Index*, 9th Edition, Merck & Co., Rahway, NJ, 1976.

# **H SOURCES OF DISPERSING AIDS**



## SOURCES OF DISPERSING AIDS

Dispersant	Source
Aerosol OT Aerosol 22	American Cyanamid Company, Process Chemicals Department, One-T Cyanamid Plaza, Wayne, NJ 07470
Calcium Chloride	Can be purchased at most laboratory supply houses.
Calgon Calgon T	Calgon Corporation, Water Management Division, Calgon Center, P. O. Box 1346, Pittsburgh, PA 15230
Cobalt Citrate	Shepherd Chemical Company, Cincinnati, OH 45212
Cobaltous Chloride	Can be purchased at most laboratory supply houses.
Daxad 23, 30	Hampshire Chemical Corporation, 55 Hayden Avenue, Lexington, MA 02173
Dispex 40	Allied Colloids, 2301 Wilroy Road, Suffolk, VA 23434
FC-134, -161 and -170	3M Company, Chemical Division, St. Paul, MN 55141
Igepal CO-530	GAF Corporation, 1361-T Alps Road, Wayne, NJ 07470
Lomar D	Henkel, 300 Brookside Avenue, Ambler, PA 19002
Oleic Acid	Can be purchased at most laboratory supply houses.
Renex 648 Tween 20 Atlas G-3300	ICI Americas, Inc., Chemical Division, New Concordville Pike, Wilmington, DE 19897
Triton X-100 Tamol SN	Rohm and Haas Company, Independence Mall West, Philadelphia, PA 19105
Sodium Silicate "N" Brand	Philadelphia Quartz Company, 1301-T E. Fort Avenue, Baltimore, MD 21230
Pyrophosphate (TSPP)	Can be purchased at most laboratory supply houses.
Zonyl A, S-13	E. I. DuPont de Nemours and Company, Dyes and Chemical Division, 1000-T Market Street, Wilmington, DE 19898



# I SEDISPERSE PARTICLE DISPERSION LIQUIDS

Description	I-3
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Material Properties	I-4
First Aid Treatment	I-4





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# SEDISPERSE<sup>®</sup> PARTICLE DISPERSION LIQUIDS

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## Description

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Sedisperse A-series and P-series liquids are stable, balanced formulations for dispersing insoluble particles. These liquids are primarily saturated aliphatic hydrocarbons. Sedisperse A-series liquids are colorless while P-series liquids are pale yellow. These liquids produce nearly universal dispersions of powder-liquid systems with solids concentrations below three weight percent and to as much as five weight percent in some cases. Sedisperse liquids solubilize adsorbed moisture.

Sedisperse W-series liquids are slightly anionic, non-foaming, aqueous formulations for dispersing insoluble particles. They also produce nearly universal dispersions of systems with solids concentrations generally below three weight percent.

Sedisperse liquids are non-irritating, non-toxic, non-carcinogenic and non-explosive. The organic Sedisperse liquids will burn, but will not support combustion at room temperature.

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## Storage Requirements

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Keep containers closed. Keep containers from freezing. If a container develops a leak during storage, transfer it to another clean container. Spillage may be cleaned using detergent and water. Sometimes particles may crystallize and settle out of Sedisperse liquids during storage. This is usually a result of exposure to cold temperatures. It is corrected by warming the Sedisperse to 40-50 °C and then vigorously shaking the liquid in a closed container to re-dissolve the particulates. Micro-organisms may also begin to grow in Sedisperse W-series liquids. These can usually be removed by filtering and the liquid is again usable for particle dispersion.

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## Technical Data

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Recommended techniques for using these liquids:

1. Disperse particles using energy from an ultrasonic bath or probe accompanied by continuous, moderate mechanical agitation to force particles through the nodes of the standing ultrasound waves.

2. For sedimentation particle size analysis, first disperse the powder in Sedisperse and estimate the size of the largest particles using a microscope. Next, calculate the liquid viscosity needed by using the relationship

$$\eta = 0.0023 D_{\max} \sqrt{D_{\max} (\rho - 1)}$$

where

$\eta$  = minimum viscosity permitted in mPa•s (or cp),

$D_{\max}$  = equivalent spherical diameter of the largest particles in  $\mu\text{m}$ , and

$\rho$  = density of the particles in  $\text{g}/\text{cm}^3$ .

This calculation assumes a particle Reynolds number of 0.1. To convert mPa•s to poise, divide by  $10^2$ .

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## Material Properties

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A Material Safety Data Sheet (MSDS) is supplied with each purchase. It should be consulted for the following information:

1. Oral Toxicity.
2. Local effect on eyes.
3. Local effect on skin.
4. Shock Sensitivity.
5. Decomposition characteristics.
6. Heat generation characteristics.
7. Recommended extinguishing agents.
8. Hazard by inhalation.

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## First Aid Treatment

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The Material Safety Data Sheet (MSDS) supplied with each liquid should be consulted for the following first aid information:

1. Skin contact.
2. Eye contact.
3. Inhalation.
4. Antidote in case of swallowing.

# J DATA REDUCTION

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Reynolds Number	J-20



## DATA REDUCTION

### Data Acquisition

The basic data acquired are in the form of cumulative mass percent finer vs. diameter. An explanation of the method for acquiring the data is provided below.

#### Diameter

Diameter for a given set of sedimentation conditions is given by Stokes equation as follows:

$$D = \left[ \frac{18\eta}{(\rho - \rho_0)g} \right]^{1/2} \times \left[ \frac{h}{t} \right]^{1/2}$$

where

- D = diameter (cm, multiply by 10000 for micrometers)
- $\eta$  = liquid viscosity (poise, multiply by 0.01 for cp)
- h = sedimentation height (cm)
- $\rho$  = sample density ( $\text{g/cm}^3$ )
- $\rho_0$  = liquid density ( $\text{g/cm}^3$ )
- g = acceleration due to gravity (981 cm/s/s)
- t = sedimentation time (sec)

All data are acquired at one of 220 predetermined sedimentation heights, ranging from 2.54 cm to 0.0079375 cm.

Sample density is user-entered. Liquid viscosity and density are user-entered, or they are calculated using the sedimentation cell temperature and interpolating from the user-selected Liquid Properties Set (see Liquid Properties Interpolation).

Target diameters for data collection are determined as follows:

Up to 250 target diameters are selected, evenly spaced on a log diameter basis, between the user-selected starting diameter and ending diameter. Note that this gives the operator some choice in the resolution of the data relative to the log diameter axis: selecting a narrower range of analysis provides more data points in a given range of diameters. Maximum resolution is obtained by selecting starting and ending diameters spanning only one decade (factor of 10), providing 250 data points per decade resolution.

Target sedimentation heights and times are selected based on run type (high speed, standard, or high resolution) and Stokes' equation.

During analysis, mass % data will be taken at these target heights, and as close to these target times as possible, allowing for cell movement, data acquisition delay time, and sequential collection of data points. The actual time of data collection will be recorded for each point, so that actual diameter may be calculated later.

Height, time, density, and viscosity data are stored separately, so that corrections to density and viscosity can be made after the analysis and diameters are recalculated.

## Liquid Properties Interpolation

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The density and viscosity of the sedimentation liquid at the time of analysis are interpolated as follows, using a liquid properties table of three points of density and viscosity versus temperature, and the cell temperature reading at the start of analysis.

### Density

---

$$B = \frac{((d2 - d1) - (d3 - d1) \times ((t2 - t1) / (t3 - t1)))}{(d1 \times (2 - t3))}$$

$$A = (1 - (d2/d1) + B \times (t2 - t1)^2) / (t2 - t1)$$

$$\rho_o = d1 \times (1 - A \times (tc - t1) + B \times (tc - t1)^2)$$

where

t1, t2, t3	=	temperatures from liquid properties table (degrees C)
d1, d2, d3	=	densities at t1, t2, t3 respectively (g/cc)
A	=	first order coefficient
B	=	second order coefficient
tc	=	cell temperature reading at start of analysis (degrees C)
$\rho_o$	=	liquid density at analysis temperature (g/cc)

## Viscosity

---

$$C = (v1 \times (1 - ((t1 - t2)/(t1 - t3))) - v2 + v3 \times (t1 - t2)/(t1 - t3)) / ((t1 - t2) \times (t2 - t3))$$

$$B = (v1 - v2 - (C \times (t1^2 - t2^2))) / (t1 - t2)$$

$$A = v1 - (B \times t1) - (C \times t1^2)$$

$$\eta = e^{(A + B/tk) + (C/tk^2)}$$

where

t1, t2, t3 = 1/(t + 273.15) for t = each of the 3 temperatures in the liquid properties table (t in degrees C)

v1, v2, v3 = ln(v) for v = each of the 3 viscosities (cp)

A, B, C = 0th, 1st, and 2nd order coefficients, respectively

tk = cell temperature at start of analysis (degrees K, i.e. 273.15 + degrees C)

$\eta$  = viscosity at analysis temperature (cp)

## Mass Percent

---

The mass percent of sample present at a given sedimentation height after a given time is determined by relating the x-ray transmission intensity at that point to the intensity with no sample present (baseline), and the intensity with all of the sample present (full scale):

$$\text{mass \%} = (\log(I_m) - \log(I_b)) / (\log(I_f) - \log(I_b)) \times 100$$

where

$I_m$  = intensity at data point (mass % being determined)

$I_b$  = intensity at baseline (mass % = 0)

$I_f$  = intensity at full scale (mass % = 100)

The  $I_b$  and  $I_f$  values are average values to minimize random variations in the X-ray intensity. The average of these values is used to compute the mass percent.

One set of baseline data may be used for scaling multiple analyses until another set of baseline data are collected.

After the sample is loaded while the cell pump is still on and the sample fully suspended and evenly distributed throughout the cell, bubble elimination data are collected at between 110 and 220 predetermined analysis heights, based on the type of bubble elimination selected. In addition, a single average full-scale value is computed at the starting analysis height.

Mass percent data appearing on the 'Analysis Results' screen has been smoothed with an 11-point evenly weighted running average.

When data are saved permanently after all analyses on a sample are completed, the mass percent values are smoothed before storage in the sample file as follows:

The mass percent values are smoothed with an 11-point running average, just as for the 'Analysis Results' screen. From these data, a set of mass percent values are interpolated at 250 evenly spaced intervals on a log diameter basis, using linear interpolation between the two adjacent collected points to get each evenly spaced point. This is done because the next smoothing step requires evenly spaced data points, and the collected data can vary from even log diameter spacing due to limitations on time of collection, as noted above.

The evenly spaced mass percent values are smoothed using a digital filter which removes high-frequency variations from the data. The final, stored mass percent values are obtained by interpolating to a standard size table with 40 logarithmically, evenly-spaced sizes per decade.



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## Reduction of Collected Data

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### Mass Data

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In order to obtain cumulative mass percent data, the smoothed mass percent data scaled to the specified full scale value:

For each of the total number of points collected,

$$\text{CumMassFiner (\%)} = \text{MassFiner} \times \frac{\text{FullScale}}{100.0}$$

Cumulative mass percent coarser data are simply the difference of scaled mass percent finer data from 100:

For each of the total number of points collected,

$$\text{CumMassCoarser (\%)} = 100.0 (\%) - \text{CumMassFiner (\%)}$$

These cumulative mass data (finer and coarser) are represented directly in tabular form and as y-axis data in the CUMULATIVE MASS FINER VS. DIAMETER and CUMULATIVE MASS COARSER VS. DIAMETER plots (cumulative mass distribution curve). Also, cumulative mass data are used to derive mass frequency and log probability data.

### Mass Frequency Data

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The mass frequency of a particle size interval is the difference between the cumulative mass percent interpolated at the end points of the interval. The interpolation is performed using a spline fit to the cumulative mass data.

### Cumulative Data

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Any cumulative quantity can be expressed as *Coarser* or *Finer* (Retained or Passed on the Tabular Report by Sieve Size).

For data defined by the standard class sizes (Summary, Tabular Defined by Size Class, and Graphs):

$$\text{CumFracCoarser}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k > \text{AvgDiam}_i$$

$$\text{CumFracFiner}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k < \text{AvgDiam}_i$$

$$\text{CumFracRetain}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k \geq \text{AvgDiam}_i$$

$$\text{CumFracPass}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k < \text{AveDiam}_i$$

or equivalently,

$$\text{CumFracFiner}_i = 1.0 - \text{CumFracCoarser}_{i-1}$$

$$\text{CumFracRetain}_i = \text{CumFracCoarser}_{i-1}$$

$$\text{CumFracPass}_i = 1.0 - \text{CumFracCoarser}_{i-1}$$

For Tabular Defined by SizeTable or by Sieve Sizes:

CumFrac (Coarser or Finer, Retained or Passed) is calculated for the standard size classes as defined above. CumFrac is then interpolated from CumFrac vs. Particle Size at each particle size in the Size table or aperture size in the Sieve table.

## Peak Report Data

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Peak report data are calculated as:

$$\text{DiffFreqFrac}_i = \frac{\text{FreqFrac}_i}{\log\left(\frac{\text{HighDiam}_i}{\text{LowDiam}_i}\right)}$$

Starting at the small particle size end of the frequency distribution:

1. Scan  $\text{DiffFreqFrac}_i$  for a local maximum, i.e.,

$$\text{DiffFreqFrac}_k > \text{DiffFreqFrac}_{k+1}, \text{ and}$$

$$\text{DiffFreqFrac}_k > \text{DiffFreqFrac}_{k-1}$$

$\text{AvgDiam}_k$  is the mode of the candidate peak.

2. Scan  $\text{DiffFreqFrac}_i$  from class  $k$  toward smaller particle sizes to find a local minimum, i.e.,

$$\text{DiffFreqFrac}_m = 0, \text{ or}$$

$$\text{DiffFreqFrac}_m < \text{DiffFreqFrac}_{m+1} \text{ and } \text{DiffFreqFrac}_m < \text{DiffFreqFrac}_{m-1}$$

$\text{LowDiam}_m$  is the low diameter of the candidate peak .

3. Scan  $\text{DiffFreqFrac}_i$  from class  $k$  toward larger particle sizes to find a local minimum, i.e.,

$$\text{DiffFreqFrac}_n = 0, \text{ or}$$

$$\text{DiffFreqFrac}_n < \text{DiffFreqFrac}_{n+1} \text{ and } \text{DiffFreqFrac}_n < \text{DiffFreqFrac}_{n-1}$$

$\text{HighDiam}_n$  is the high diameter of the candidate peak.

4. Sum values of  $\text{FreqFrac}_i$  from  $i=m$  to  $i=n$ .

If the sum is greater than or equal to the Minimum Fraction to Report, the candidate peak is qualified and the sum is the Fraction of Distribution. Other peak quantities are calculated using the same formulas as for the entire distribution, except the only range from class  $m$  to class  $n$  is used.

Otherwise, the candidate peak is disqualified.

In either case, peak identification repeats from step 1, starting with class  $n$ . When the end of the distribution is reached by scanning in either step 1 or step 3, peak identification is complete.

In step 1 if the end of the distribution is reached on an increasing frequency slope, i.e.,  $\text{DiffFreqFrac}_k > \text{DiffFreqFrac}_{k-1}$ , then class  $k$  is treated as the mode of a candidate peak and as the high size end of the candidate peak.

If the beginning or end of the distribution is reached while scanning for a local minimum in step 2 or 3, the beginning or ending class is treated as the local minimum.

For calculating Standard Deviation for  $N$  tests, peaks from the various tests are simply matched by their order, i.e., peak 1 from test 1 is matched with peak 1 from test 2, etc. If all tests do not have the same number of peaks, Standard Deviation for  $N$  tests is reported as N/A (not available). If the peak numbers are not the same and the user chose average of  $n$  tests, a single row is filled in with all N/A (including the peak number).

## Number Frequency Data

---

The number frequency is computed from the mass frequency distribution as defined by the standard size classes.

For each class:

$$\text{NumFreq}_i = \frac{\text{MassFreq}_i / \text{AvgDiam}_i^3}{\sum_k \text{MassFreq}_k / \text{AvgDiam}_k^3}$$

where

$\text{NumFreq}_N =$  NumberFrequency for class  $N$

$\text{MassFreq}_N =$  Mass frequency for class N

$\text{AvgDiam} =$  Average diameter for class N

The cumulative number percent for a class is computed as the summation of the non-negative frequencies for all smaller classes.

## Surface Area Frequency Data

---

The surface area frequency is computed from the mass frequency distribution as defined by the standard size classes.

$$\text{AreaFreq}_i = \frac{\text{MassFreq}_i / \text{AvgDiam}_i}{\sum_k \text{MassFreq}_k / \text{AvgDiam}_k}$$

For each class:

where

$\text{AreaFreq}_N =$  NumberFrequency for class N

$\text{MassFreq}_N =$  Mass frequency for class N

$\text{AvgDiam} =$  Average diameter for class N

The cumulative number percent for a class is computed as the summation of the non-negative frequencies for all smaller classes.

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## Size Statistics

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### Standard Deviation of Quantity for N Tests

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For quantity, substitute the variable name for which the standard deviation is being determined. The subscript k refers to the test number.

If NumTests <= 1, StdDevTestQuantity = 0.

Otherwise,

$$\text{MeanTestQuantity} = \frac{\sum \text{Quantity}_k}{\text{NumTests}}$$

$$\text{StdDevTestQuantity} = \sqrt{\frac{\sum (\text{Quantity}_k - \text{MeanTestQuantity})^2}{\text{NumTests} - 1}}$$

---

### Mode

---

In order to do a mode calculation, the definition of the standard classes is extended over the range of input for all the data; frequencies are calculated for these classes. It is this frequency data that is used in determining the peak quantities so that all the classes are of the same width.

ModeDiam = AvgDiam<sub>i</sub> such that DiffFreqFrac<sub>i</sub> is the maximum DiffFreqFrac

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### Median

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MedianDiam = Diameter interpolated from HighDiam vs. CumFracCoarser at CumFracCoarser = 0.5.

If the calculation is being performed on a peak, the interpolation point is at CumFracCoarser = (CumFracCoarser<sub>m</sub> + CumFracCoarser<sub>n</sub>)/2.

## Arithmetic Calculations

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### Mean

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$$\text{MeanDiam} = \frac{\sum \text{FreqFrac}_i \cdot \text{AvgDiam}_i}{\sum \text{FreqFrac}_i}$$

### Standard Deviation (of the distribution)

---

$$\text{StdDevDiam} = \sqrt{\frac{\sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^2}{\sum \text{FreqFrac}_i}}$$

### Coefficient of Variation:

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$$\text{CoefVar} = \frac{\text{StdDevDiam}}{\text{MeanDiam}}$$

### Skewness:

---

$$\text{Skew} = \frac{\sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^3 / \sum \text{FreqFrac}_i}{(\sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^2 / \sum \text{FreqFrac}_i)^{3/2}}$$

### Kurtosis

---

$$\text{Kurt} = \frac{\sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^4 / \sum \text{FreqFrac}_i}{(\sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^2 / \sum \text{FreqFrac}_i)^2} - 3$$

**+xσ**

---

$$\text{PlusNSig} = \text{MeanDiam} + x \cdot \text{StdDevDiam}$$

where x is a user-selected number.

**-xσ**

---

$$\text{MinusNSig} = \text{MeanDiam} - x \cdot \text{StdDevDiam}$$

where x is a user-selected number.

## Geometric Calculations

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### Mean

---

$$\text{GeoMeanDiam} = 10^{\frac{\sum(\text{FreqFrac}_i \log(\text{AvgDiam}_i))}{\sum \text{FreqFrac}_i}}$$

### Standard Deviation (of the distribution)

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$$10^{\text{StdDevLogDiam}}$$

### Standard Deviation of Log

---

$$\text{StdDevLogDiam} = \sqrt{\frac{\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^2}{\sum \text{FreqFrac}_i}}$$

### Skewness of Log

---

$$\text{SkewLog} = \frac{\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^3 / \sum \text{FreqFrac}_i}{(\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^2 / \sum \text{FreqFrac}_i)^{3/2}}$$

### Kurtosis of Log

---

$$\text{KurtLog} = \frac{\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^4 / \sum \text{FreqFrac}_i}{(\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^2 / \sum \text{FreqFrac}_i)^2} - 3$$



**+xσ**

---

$$\text{PlusNSigLog} = 10^{\log(\text{GeoMeanDiam}) + x \log(\text{GeoStdDevDiam})}$$

**-xσ**

---

$$\text{MinusNSigLog} = 10^{\log(\text{GeoMeanDiam}) - x \log(\text{GeoStdDevDiam})}$$

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## Specification/Reference Quantities

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### Out of Spec

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$SampCumFrac_i$  = cumulative fraction coarser/finer/passed/retained for class i from sample distribution

$CoarseSpecCumFrac_i$  = cumulative fraction coarser/finer/passed/retained for class i from Coarse Specification distribution interpolated if the bins are of different size. This is always the average of all tests in the named sample file.

$FineSpecCumFrac_i$  = cumulative fraction coarser/finer/passed/retained for class i from FineSpecification distribution interpolated if the bins are of different size. This is always the average of all the tests in the named sample file.

If  $\{SampCumFracCoarser_{i-1} > CoarseSpecCumFracCoarser_{i-1}\}$

$$OutSpecFracCoarser_i = SampCumFracCoarser_{i-1} - CoarseSpecCumFracCoarser_{i-1}$$

If  $\{SampCumFracCoarser_{i-1} < FineSpecCumFracCoarser_{i-1}\}$

$$OutSpecFracCoarser_i = SampCumFracCoarser_{i-1} - FineSpecCumFracCoarser_{i-1}$$

or,

$$OutSpecFracFiner_i = -OutSpecFracCoarser_{i-1}$$

$$OutSpecFracRetain_i = OutSpecFracCoarser_{i-1}$$

$$OutSpecFracPass_i = OutSpecFracCoarser_{i-1}$$

## Difference from Reference

---

$\text{SampCumFrac}_i$  = cumulative fraction coarser/finer/passed/retained for class  $i$  from sample distribution

$\text{RefSpecCumFrac}_i$  = cumulative fraction coarser/finer/passed/retained for class  $i$  from Reference Specification distribution interpolated if the bins are of different size. This is always the average of all the tests in the named sample file.

$\text{DiffRefCoarser}_i = \text{SampCumFrac}_i - \text{RefCumFrac}_i$

or,

$\text{DiffRefFiner}_i = \text{DiffRefCoarser}_{i-1}$

$\text{DiffRefRetain}_i = \text{DiffRefCoarser}_{i-1}$

$\text{DiffRefPass}_i = \text{DiffRefCoarser}_{i-1}$

## Maximum Out of Spec

---

$\text{MaxOutSpecFrac} = \text{maximum (abs value (OutSpecFrac}_i))$

## Pass/Fail by Specification

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If  $\text{MaxOutSpecFrac} = 0$ ,  $\text{PassFail} = \text{Passed by Specification}$

Otherwise,  $\text{PassFail} = \text{FAILED by Specification}$

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## SPC Report Variables

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### Regression Chart

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The line of best fit for the Regression Chart is calculated by the usual least squares method. If there is only a single point, or all N points have the same x-value, there can be no line of best fit in the standard form.

$$XAve = \frac{\sum x_i}{N}$$

$$YAve = \frac{\sum y_i}{N}$$

$$\text{Slope} = \frac{\sum (x_i - XAve)(y_i - YAve)}{\sum (x_i - XAve)^2}$$

$$Y\text{Intercept} = YAve - \text{Slope} \cdot XAve$$

The coefficient of correlation for this line also is calculated in the usual way.\*

$$\sigma_x = \sqrt{\frac{\sum (x_i - XAve)^2}{N}}$$

$$\sigma_y = \sqrt{\frac{\sum (y_i - YAve)^2}{N}}$$

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\* Mathematical Handbook for Scientists and Engineers, G.A., Korn and T.M. Korn, McGraw Hill, Sec. 18.4 (1968).

$$\text{Cov}(x,y) = \frac{\sum(x_i - \text{XAve})(y_i - \text{YAve})}{N}$$

$$\text{CorrelationCoef} = \frac{\text{Cov}(x,y)}{\sigma_x \sigma_y}$$

## Control Chart

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$$\text{Mean} = \frac{\sum y_i}{N}$$

$$\text{StdDev} = \sqrt{\frac{\sum (y_i - \text{Mean})^2}{N - 1}}$$

$$\text{CoefVar} = \frac{\text{StdDev}}{\text{Mean}}$$

$$\text{PlusNSig} = \text{Mean} + n \cdot \text{StdDev}$$

$$\text{MinusNSig} = \text{Mean} - n \cdot \text{StdDev}$$

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## Reynolds Number

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The Reynolds Number is calculated as follows:

$$\text{Reynolds Number} = \left[ \frac{D(\mu\text{m})}{10000(\mu\text{m}/\text{cn})} \right]^3 \times \left[ \frac{\rho_0(\text{g}/\text{cc}) \times (\rho - \rho_0)(\text{g}/\text{cc}) \times g(\text{cm}/\text{s}/\text{s})}{K \times (\eta(\text{cp}) \times 0.01 (\text{poise}/\text{centipoise})) \times 2^2} \right]$$

where

- D = specified starting diameter,
- $\rho_0$  = liquid density,
- $\rho$  = sample density,
- $\eta$  = liquid viscosity,
- g = acceleration due to gravity, and
- K = Stokes' constant = 18.

The Reynolds Number is displayed on the tabular report.

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## Log Probability Data

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Log probability data are a transformation of cumulative mass finer data as a means of determining how well cumulative and differential mass data represent statistical normal distributions. Since cumulative mass finer data are essentially data indicating the probabilities of finding particles of mass finer at given diameters, log normal probability data are a fit of the cumulative mass data to the defined, symmetrical probabilities tabulated for a normal distribution.

The log probability table used is a subset of 99 points, ranging from (-2.88, 0.2%) to (0.0, 50.0%) to (+2.88, 99.8%), from a standard normal distribution table (see log probability interpolation table). The x-axis and y-axis data which are plotted on a log probability graph are calculated as follows:

1. X-axis boundaries are determined by the spline interpolation at 0.2% and 99.8% from cumulative mass finer vs. log diameter. This gives Xprob\_beg and Xprob\_end, respectively.

2. For each of the number of points collected,

If Diameter value is between Xprob\_beg and Xprob\_end and

if CumMassFiner value is between 0.2% and 99.8%, then

Xprob value = Diameter value

Yprob value = Spline interpolation at CumMassFiner values of the x vs. y log probability table values

*Log Probability Interpolation Table*

X (%)	Y	X (%)	Y	X (%)	Y
0.20	-2.88	33.00	-0.44	68.08	0.47
0.99	-2.33	34.83	-0.39	69.15	0.50
2.02	-2.05	35.94	-0.36	69.85	0.52
3.01	-1.88	37.07	-0.33	70.88	0.55
4.01	-1.75	37.83	-0.31	71.90	0.58
4.95	-1.65	38.97	-0.28	72.91	0.61
5.94	-1.56	40.13	-0.25	73.89	0.64
6.94	-1.48	40.90	-0.23	74.86	0.67
7.93	-1.41	42.07	-0.20	76.11	0.71
9.01	-1.34	42.86	-0.18	77.04	0.74
10.03	-1.28	44.04	-0.15	77.94	0.77
10.93	-1.23	44.83	-0.13	79.10	0.81
11.90	-1.18	46.02	-0.10	79.95	0.84
12.92	-1.13	46.81	-0.08	81.06	0.88
14.01	-1.08	48.01	-0.05	82.12	0.92
14.92	-1.04	48.80	-0.03	82.89	0.95
16.11	-0.99	50.00	0.00	83.89	0.99
17.11	-0.95	51.20	0.03	85.08	1.04
17.88	-0.92	51.99	0.05	85.99	1.08
18.94	-0.88	53.19	0.08	87.08	1.13
20.05	-0.84	53.98	0.10	88.10	1.18
20.90	-0.81	55.17	0.13	89.07	1.23
22.06	-0.77	55.96	0.15	89.97	1.28
22.96	-0.74	57.14	0.18	90.99	1.34
23.89	0.71	57.93	0.20	92.07	1.41
25.14	-0.67	59.10	0.23	93.06	1.48
26.11	-0.64	59.87	0.25	94.06	1.56
27.09	-0.61	61.03	0.28	95.05	1.65
28.10	-0.58	62.17	0.31	95.99	1.75
29.12	-0.55	62.93	0.33	96.99	1.88
30.15	-0.52	64.06	0.36	97.98	2.05
30.85	-0.50	65.17	0.39	99.01	2.33
31.92	-0.47	67.00	0.44	99.80	2.88

*Standard Report Tables*

Standard Diameter	Standard Mass %
300	95
250	90
200	85
150	80
100	75
80	70
60	65
50	60
40	55
30	50
25	45
20	40
15	35
10	30
8	25
6	20
5	15
4	10
3	5
1.5	
1	
0.8	
0.6	
0.5	
0.4	
0.3	
0.2	
0.1	



# K SEDIGRAPH X-RAY SAFETY INFORMATION

General	K-3
X-ray Source	K-3
Warning/Indicator Lights	K-4



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## SEDIGRAPH X-RAY SAFETY INFORMATION

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In a continuing effort to provide maximum safety to operators of Micromeritics equipment, and to ensure full compliance with all known government safety regulations regarding X-rays, Micromeritics provides a high level of X-ray safety on its SediGraph line.

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### General

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The SediGraph Particle Size Analysis System employs soft X-rays to detect relative particle concentration because X-ray absorption is directly proportional to particle mass. This X-ray beam is inaccessible to the operator at all times due to cabinet construction, a door enclosing the cell compartment, a mechanical shutter that blocks the beam's entry into the cell compartment when that door is opened more than 12 mm (0.5 in.), and electrical interlocks that interrupt power to the X-ray tube when the cell compartment door or top panel is opened.

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### X-ray Source

---

X-rays are generated by a small, air-cooled tube having a tungsten target inclined at 55° to a thin beryllium window. It is operated at a potential of 13,600 VDC with a power input of less than 41 Watts. The greatest value the anode voltage can attain in a malfunction is 15,000 VDC. Only the tungsten L-lines are excited, of which the L is primary. This primary radiation has an energy of approximately 10,000 eV and a corresponding wavelength of 0.125 nm (1.25 Angstroms). The integrated radiation density of the direct, unattenuated beam over a 25-mm circular aperture is between 300 and 400 milliroentgens per hour. The X-ray beam is, for example, 60% blocked by a 51- $\mu\text{m}$  (0.002-in.) thick film of the plastic polyvinyl chloride and essentially completely blocked by 130- $\mu\text{m}$  (0.005-in.) thick steel. Nevertheless, the shutter mechanism should never be defeated.

Radiation levels outside the instrument or in the cell compartment when the compartment door is open are well below 0.5 milliroentgen per hour. **Most jurisdictions require the registration of radiation producing devices regardless of kind or intensity level.** Check with the appropriate authority in your area\*.

Since a potential of 13,600 VDC and a current of up to 3 mA generate the X-rays, the instrument should be unplugged before any panel is removed for any purpose. This ensures that X-ray generation ceases and high voltages are eliminated.

---

\*Based on the above information, SediGraph users in the State of Georgia have regularly been granted waivers to the State of Georgia "Rules and Regulations for X-Ray" by the Radiological Health Section of the Georgia Department of Human Resources.

---

## Warning/Indicator Lights

---

The SediGraph control switches and indicators are located on the front panel of the analytical unit and include a keyswitch to turn the X-ray tube on. The key is held captive when the keyswitch is on. There are two warning lights: An amber X-RAY STANDBY light and a red X-RAY ON light. With the analytical unit connected to the electric mains and the power switch on, the amber X-RAY STANDBY light is lit. Turning the keyswitch to the ON position causes the red X-RAY ON light to illuminate signaling that power is applied to the X-ray tube. When the X-RAY ON light is illuminated, power is applied to both the filament and anode of the X-ray tube. If the X-RAY ON lamp filament burns out, then power is interrupted to both the filament and anode of the X-ray tube. In order for power to be supplied to the X-ray tube filament and anode when a failure (open circuit) occurs in the X-RAY ON light, concurrent failures must occur in two independent circuits such that these circuits continue to supply power to the X-ray tube.

The SediGraph has magnetically actuated reed switches. These switches are in series with the X-RAY ON lamp filament. Whenever the top or back panel of the SediGraph is removed, the cell-compartment door is opened, the fluid module is removed, or the X-RAY ON lamp filament burns out (opens), both filament and anode power to the X-ray tube are interrupted.

These switches are in addition to the mechanical shutter which operates when the cell compartment door is opened, blocking X-rays and removes filament power when the top cover is removed. During the last 12 mm (0.5 in.) of travel of the cell compartment door to the fully closed position, the sliding pin actuates the gravity-operated, spring-assisted shutter so that the shutter is opened to allow X-rays to enter the cell compartment. When the cell compartment door is opened from the fully closed position, the shutter is actuated during the first 12 mm (0.5 in.) of travel to close and block x-rays from entering the cell compartment. As long as the cell compartment door remains open, the shutter blocks X-rays from entering the cell compartment and the X-Ray Detection Indicator remains off.

Now, when the cell compartment door is opened, not only does the shutter block the X-ray beam but the power to the X-ray tube also is interrupted.

# L MASTERTECH INSTALLATION

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---

## MasterTech Installation

---

The MasterTech should be correctly installed and checked to make sure that it is operating properly before actual analyses are attempted.

---

## Removing Packing Material From the Unit

---

After removing the MasterTech from the shipping carton, remove all foam packing material from the unit before proceeding with installation.

---

## Selecting the Voltage

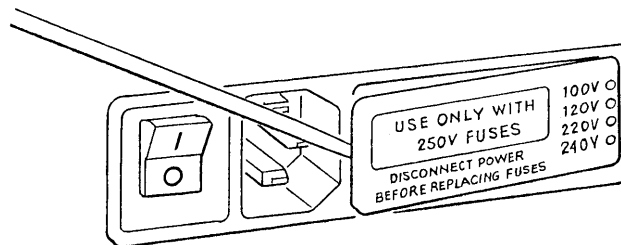
---

The MasterTech 052 leaves the factory set for 120 VAC and with the line fuse removed. The correct setting of the universal power entrance must be checked and the appropriate fuse installed before the MasterTech can be operated. The MasterTech is designed to operate with either 100, 120, 220 or 240 VAC at 50 or 60 Hz. Voltage selection and fusing are made at the power connector which is located on the rear panel of the unit.

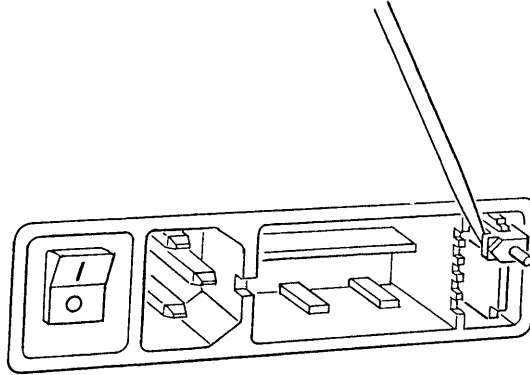


**The power cord should be disconnected from the MasterTech before removing the cover from the power input connector. Failure to disconnect the power cord could result in electrical shock.**

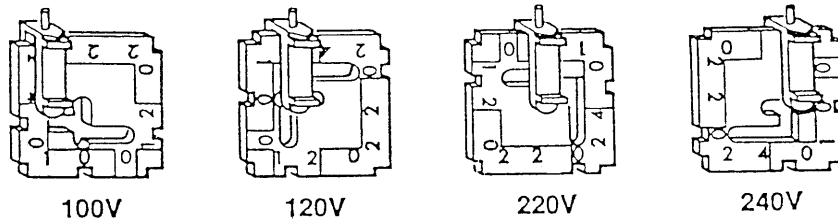
1. Make sure the power cord is disconnected from the MasterTech.
2. Using a pointed object, remove the fuse block and cover assembly from the power connector at the rear of the MasterTech.



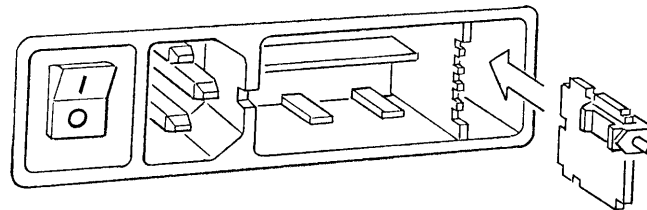
3. Pull the voltage selector card straight out of the power connector housing.



4. Orient the voltage selector card so that the desired voltage is indicated at the bottom. Orient the indicator pin so that it points upward as shown in the following illustration.

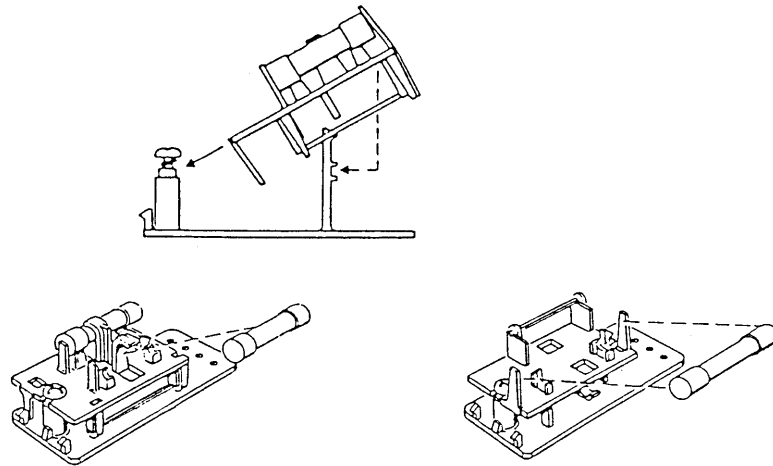


5. Insert the voltage selector card into the power connector housing with the edge containing the desired voltage first and with the printed side facing the power ON/OFF switch.





6. Fuse the input power line according to local safety practices. The input power connector can be used with either a single-fuse arrangement or a double-fuse arrangement, as shown in the following illustration.



**The power cord should be disconnected from the MasterTech when installing or replacing fuses. Failure to do so could result in electrical shock.**

- a. Observe the position of the fuse block, using the previous figure for reference. If the single-fuse arrangement is desired, position the fuse block so that the side with the single-fuse slot and the jumper bar is away from the cover.

If the double-fuse arrangement is desired, position the fuse block so that the side with the double-fuse slots is away from the cover.

- b. If the fuse block is positioned properly for the fusing desired, proceed to Step c.

If the fuse block is not positioned properly for the fusing desired:

- 1) Remove the fuse block retaining screw.
- 2) Lift the fuse block from the cover.
- 3) Rotate the fuse block.
- 4) Mount the fuse block to the cover.
- 5) Replace the retaining screw.

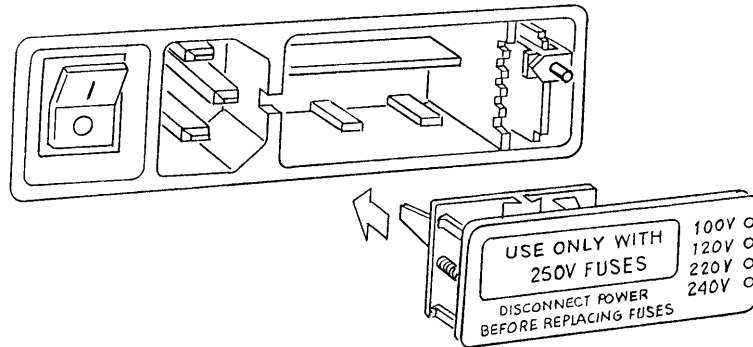


**The fuses used in the MasterTech must be identical in type and rating to that specified. Use of other fuses could result in electrical shock and/or damage to the MasterTech.**

- c. Insert appropriate fuse(s) for the input power source. Refer to the chart below for the appropriate fuse rating.

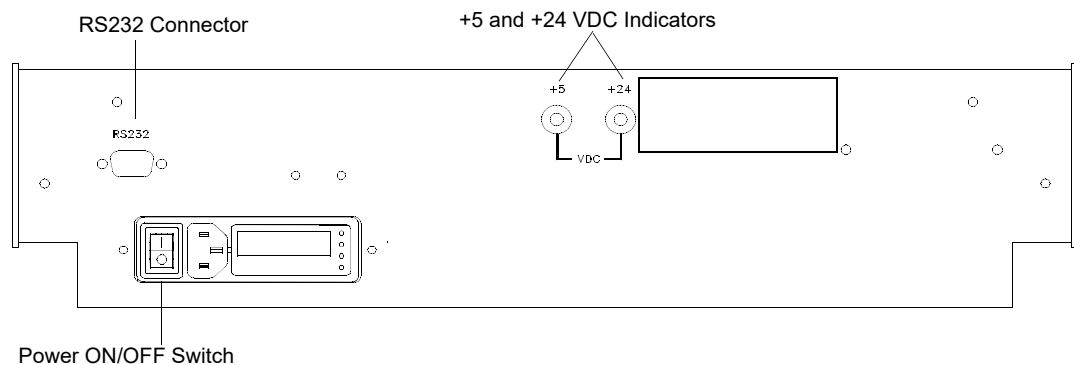
<b><u>Power Source</u></b>	<b><u>Fuse</u></b>
100-120 VAC	3AG, 2.00 Amp Slow-Blow
200-240 VAC	5x20 mm, 1.00 Amp Slow-Blow (Type T)

7. Insert fuse block and cover assembly into input power connector (as shown in the following illustration) and snap it into place. Once the fuse block and cover assembly are in place, the position of the indicator pin shows the input power selected.

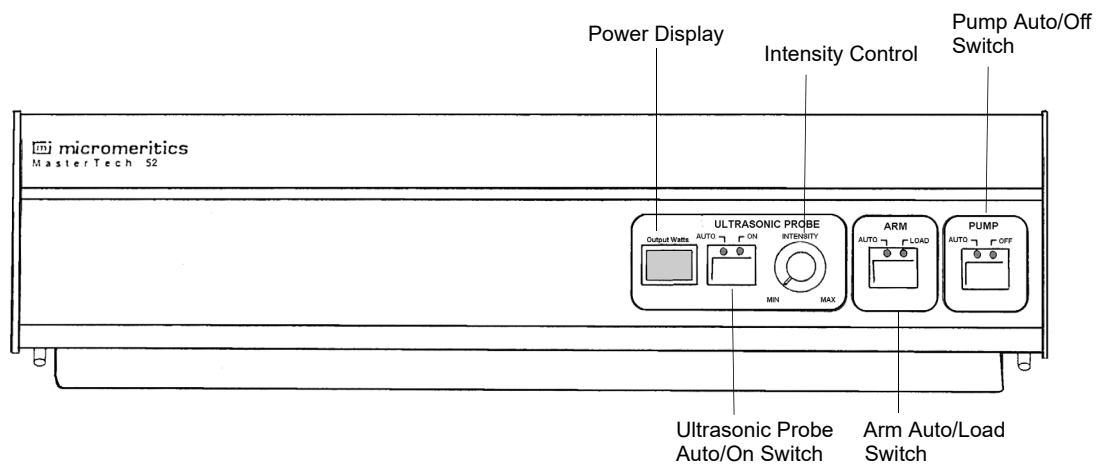


## Turning on the MasterTech

1. Make sure the proper operating voltage and fuse are selected and in place.
2. Place the POWER ON/OFF switch, located on the MasterTech rear panel, in the ON (|) position. The +5 and +24 LEDs on the rear panel and some of the LEDs in the front panel switches should illuminate.



**The ultrasonic probe should not be turned on at this point. Observe the indicator on the ULTRASONIC PROBE AUTO/ON switch on the front panel of the MasterTech (shown in the following illustration). If the indicator below ON is illuminated, press the switch to turn off the probe. The indicator below AUTO should illuminate.**



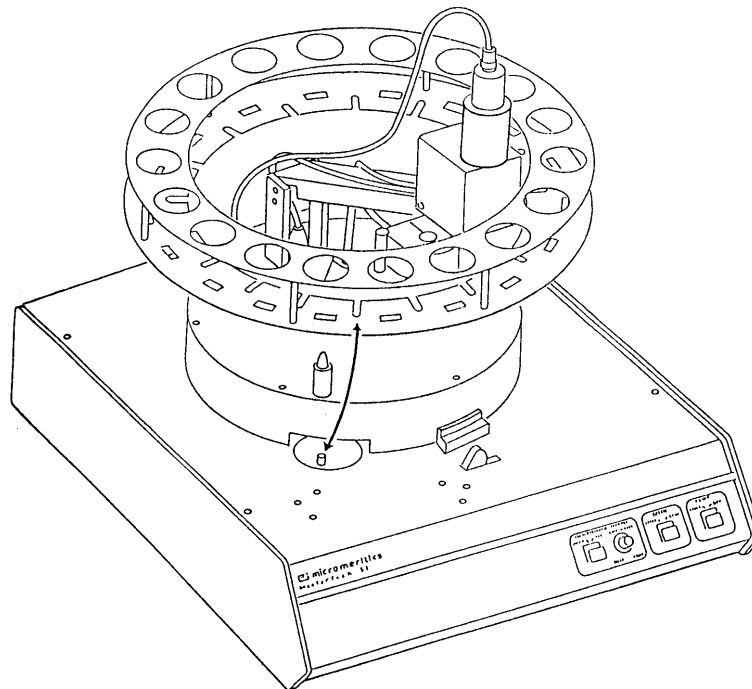
3. Press the ARM AUTO/LOAD switch on the front panel of the MasterTech. The arm should rise to the Load position, which is used for removal and replacement of the tray.

---

## Installing the Beaker Tray

---

1. Make sure the arm of the MasterTech is in the Load (uppermost) position. When the arm is in the Load position, the Load LED is illuminated. If the LED is not illuminated, press the ARM AUTO/LOAD switch.
2. Hold the tray firmly by the outside edge. Notice that the bottom of the tray has small slots positioned radially outward from the inside edge. Place the tray on the MasterTech so that the arm passes through the center opening of the tray.
3. Make sure the drive pin is lined up into a radial slot on the bottom of the tray. The position of the tray does not matter at this point.



---

## Connecting Cables

---

1. Position the MasterTech next to the SediGraph, making sure that the units are level and their bases are at the same height. Alternately, the MasterTech may be placed on top of the SediGraph.
2. Make sure that the power switches on the SediGraph and MasterTech are in the OFF position.
3. Insert one end of the serial cable into the MasterTech connector on the side panel of the SediGraph.



MasterTech connector

4. Insert the other end of the cable into the connector labeled **RS232** on the back of the MasterTech.

---

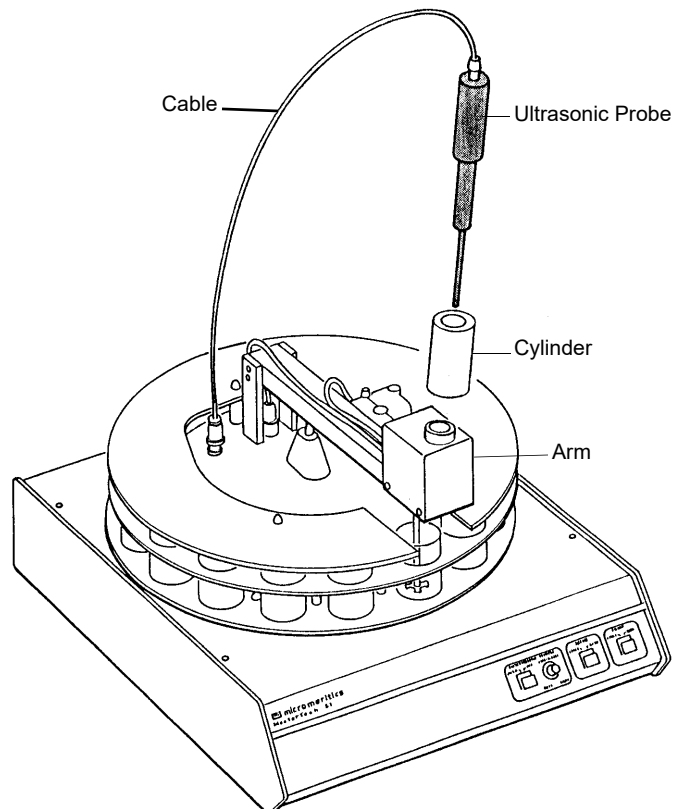
## Installing the Ultrasonic Probe

---



**Make sure that no power is supplied to the unit before starting this procedure**

1. Make sure that the power ON/OFF switch on the rear panel of the MasterTech is in the OFF (O) position.
2. Attach the probe cable to the connector labeled **Ultrasonic Probe**.



3. Ensure that the probe tip is attached to the probe; if not, attach it. A 1/4-in. probe tip is supplied with the MasterTech 052. A 1/8-in. tip is also available. (Refer to Chapter 10 for ordering information.)
4. Insert the cylinder into the arm, positioning it so that the longer slots slide over the protrusions inside the arm.

**Position the shorter slots of the cylinder over the protrusions if you are using the 1/8-in. probe.**



5. Insert the probe into the cylinder.

---

## Installing Sample Transfer Tubing

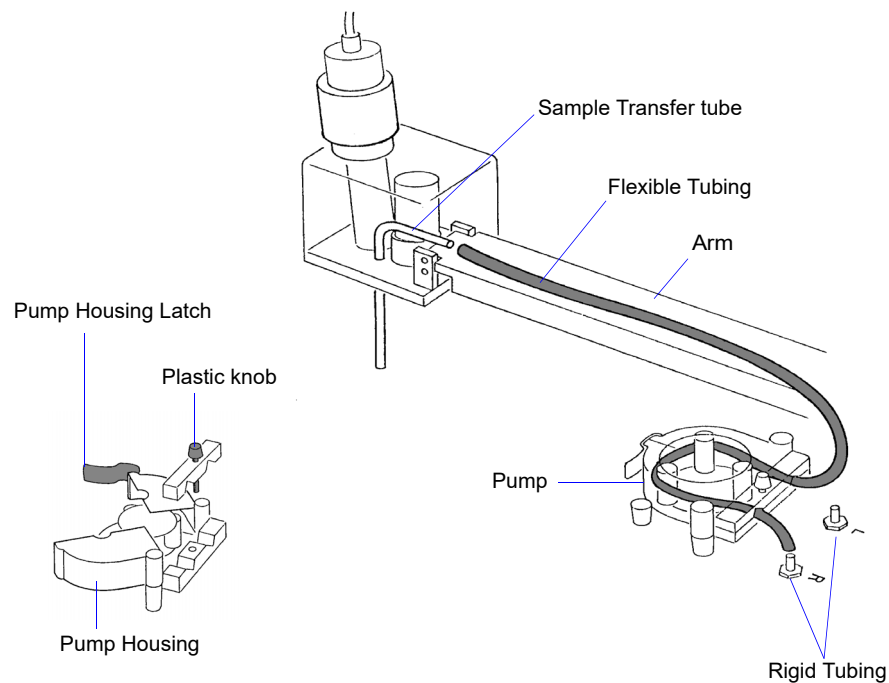
---

This section contains one set of instructions for installing the sample transfer tubing in a MasterTech with serial number 500 or below, and one set of instructions for a MasterTech with serial number 501 or above. Follow the instructions for your unit.

### MasterTech with Serial Number 500 or Below

---

1. Ensure that the MasterTech POWER switch is in the ON position and that the the arm is in the LOAD (uppermost) position; the LOAD LED is illuminated. If the LED is not illuminated, press the ARM AUTO/LOAD switch.
2. Several segments of flexible tubing are supplied with the MasterTech. Press the end of one segment of flexible tubing over the sample transfer tube until there is at least 1/2-in. (1.27 cm) overlap.



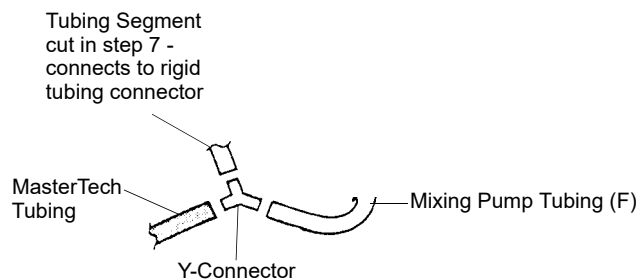
3. Unlatch the pump housing and unscrew the plastic knob on the rear of the pump.
4. Thread the tubing through the pump as shown above and attach it to the rigid tubing labeled **L** (left) or **R** (right). Choose the rigid tubing labeled with the side of the MasterTech from which you want the fluid to be discharged.
5. Close and latch the housing. Tighten the plastic knob on the rear of the pump sufficiently to prevent tubing slippage but not enough to restrict flow through the tubing.

6. Open the pump chassis cover on the SediGraph by pulling it forward.
7. Drain the system.
8. Cut the flexible tubing labeled **F** midway between the mixing pump and the rigid tubing connector on the SediGraph; remove and discard the segment remaining on the rigid tubing connector.
9. Remove a segment of flexible tubing from the accessories kit and cut a length of approximately 1 1/2 inches (3.81 cm) of tubing.
10. Attach the end of another segment of tubing to the Discharge Tube connector on the front of the MasterTech.

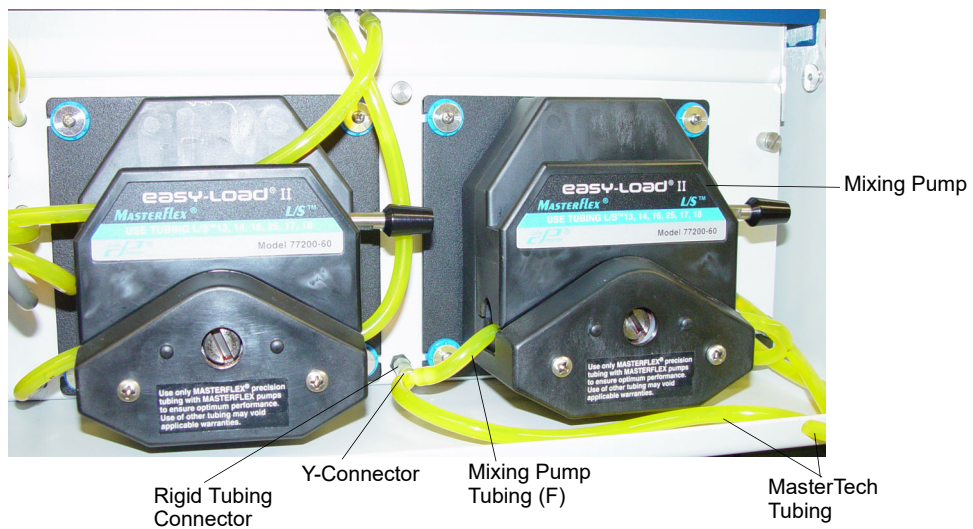


**If the MasterTech is located on top of the SediGraph, use the longer segment of tubing (P/N 052-32802-00).**

11. Thread the other end of the tubing through the hole in the analyzer lower front panel.
12. Attach tubing to the Y-connector as shown below.



13. Attach the tubing from the Y-connector to the rigid tubing connector on the analyzer.



14. Close the pump chassis cover.



## MasterTech with Serial Number 501 or Above

1. Make sure that the arm is in the Load (uppermost) position. When the arm is in the Load position, the Load LED is illuminated. If the LED is not illuminated, press the ARM AUTO/LOAD switch.

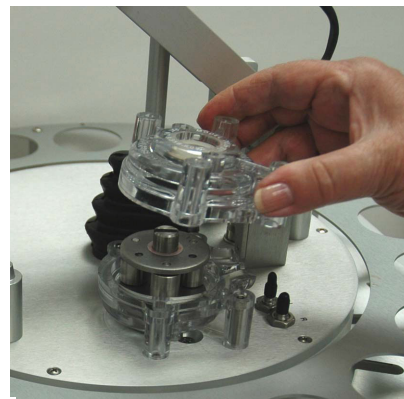


Load position

2. Unscrew the two thumbscrews from the cover of the pump housing, then remove the cover.



A

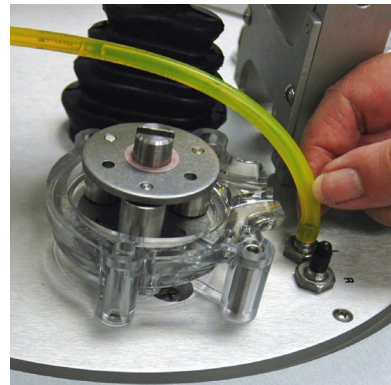


B

3. A 21-in. segment of flexible tubing is shipped with the MasterTech. Remove the cover from one of the steel tubes labeled **L** (Left) or **R** (Right). Choose the steel tube labeled with the side of the MasterTech from which you want the fluid to be discharged. Then attach one end of the flexible tubing to the steel tube.



A



B

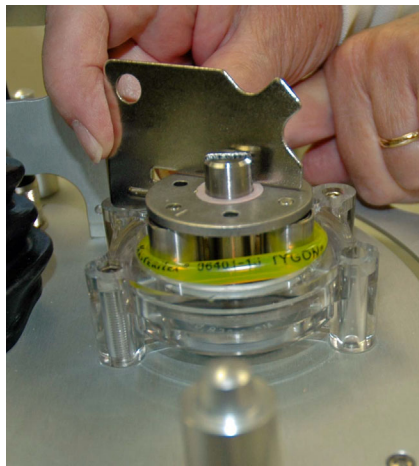
4. Loop the tubing around the pump rollers in a clockwise direction, using one hand to hold the two ends of the tubing loop in the two grooves at the base of the pump.



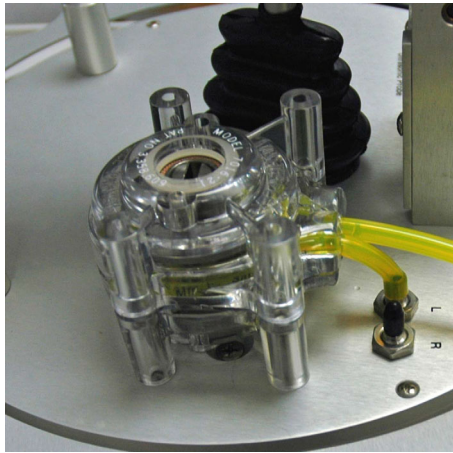
5. Insert the key between the pump rollers near the left side of the pump base, with the key blade between the tubing and the plate on the top of the rollers.



6. Turn the key clockwise so the tubing presses into the groove until the key is stopped by the peg in the right side of the pump body.



- Slide the key out, then place the cover over the pump, wiggling it slightly to align it with the pump body and press it into place. Then insert and tighten the two thumbscrews only tight enough to secure the cover.



A



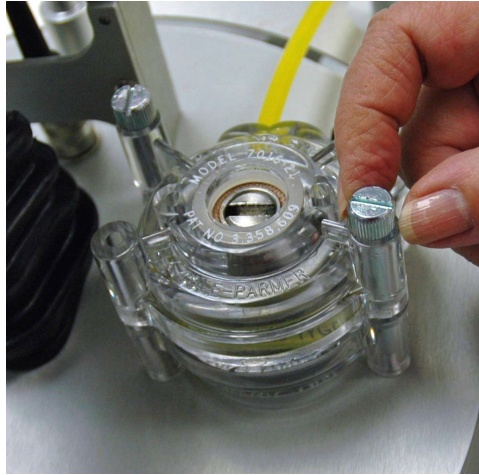
B

- Attach the other end of the flexible tubing to the Sample Transfer tube on the front of the MasterTech as shown below.



- With the instrument schematic displayed, enable Manual Mode. Right-click the **MasterTech Pump** icon and select **Turn On**.
- The pump should begin operating. If the pump does not start or is sluggish, pull on the long end of the tubing to create tension and pull excess tubing out of the pump, no more

than 1/4-in. should be required. (Loosen the thumbscrews if necessary.) When the pump is operating freely, hand-tighten the two thumbscrews, then turn the pump off.



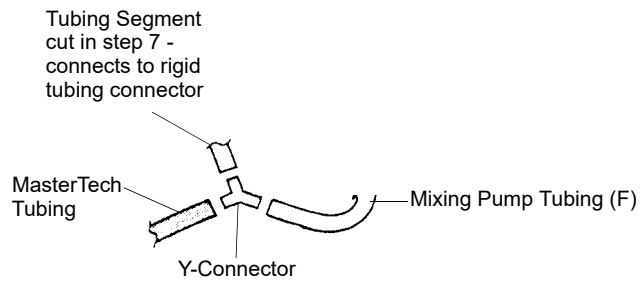
11. Press the ARM AUTO/LOAD switch to place the arm in the AUTO position.
12. Open the pump chassis cover on the SediGraph by pulling it forward.
13. Drain the system.
14. Cut the flexible tubing labeled **F** midway between the mixing pump and the rigid tubing connector on the SediGraph; remove and discard the segment remaining on the rigid tubing connector.
15. Remove a segment of flexible tubing from the accessories kit and cut a length of approximately 1 1/2 inches (3.81 cm) of tubing.
16. Attach the end of another segment of tubing to the Discharge Tube connector on the front of the MasterTech.



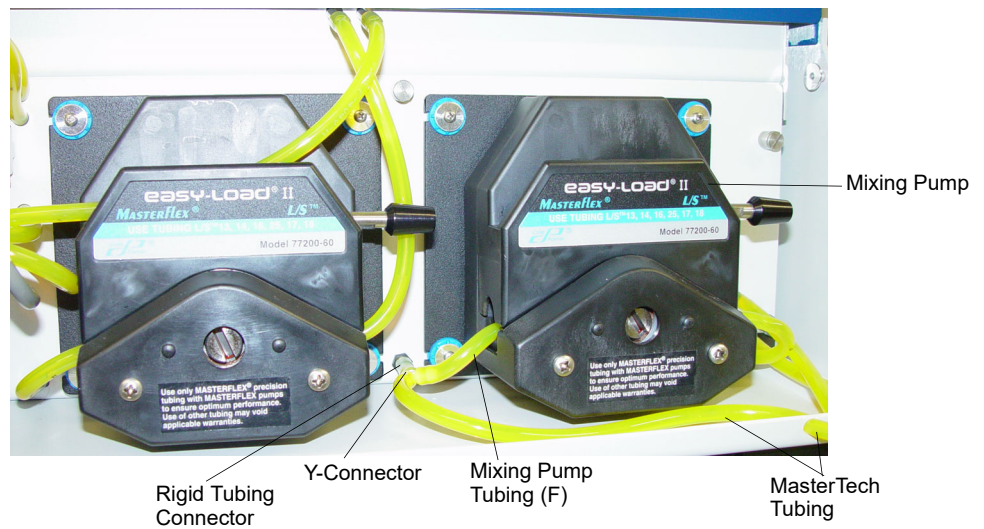
**If the MasterTech is located on top of the SediGraph, use the longer segment of tubing (P/N 052-32802-00).**

17. Thread the other end of the tubing through the hole in the analyzer lower front panel.

18. Attach tubing to the Y-connector as shown below.



19. Attach the tubing from the Y-connector to the rigid tubing connector on the analyzer.



20. Close the pump chassis cover.

---

## Verifying Operation

---

To verify operation, manually move each subsystem using the manual control option of the SediGraph 5120 analysis program.

1. Make sure that the SediGraph and MasterTech are turned on, and start the SediGraph analysis program if it has not been started.
2. Fill at least one of the supplied beakers with approximately 80 mL of water.
3. Place the beaker in the position numbered **1** on the tray.
4. To test the ultrasonic probe, remove it from the holder and insert the tip of the probe well into the water.



**NEVER operate the ultrasonic probe without having the tip immersed into a liquid. Doing so may harm the probe and/or the driving electronics. DO NOT let the tip of the probe come in contact with a glass beaker. Doing so may shatter the beaker.**

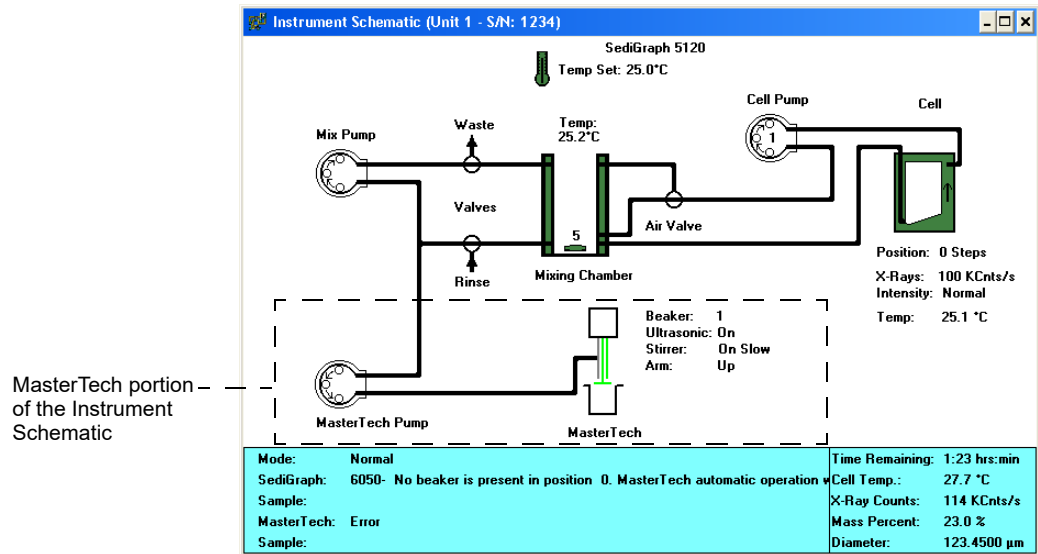
5. While holding the probe tip underwater, press the ULTRASONIC PROBE AUTO/ON switch. You will hear a high-pitched sound, indicating that the probe is working properly.



**DO NOT press the ultrasonic probe AUTO/ON switch unless the probe and its cable are properly connected to the MasterTech. Doing so may harm the driving electronics.**

6. Press the ultrasonic probe AUTO/ON switch again to turn off the probe.
7. Place the probe back into the holder.

8. From the **Unit [n]** menu, select **Enable manual control**. If the instrument schematic is not displayed, select **Show instrument schematic**.

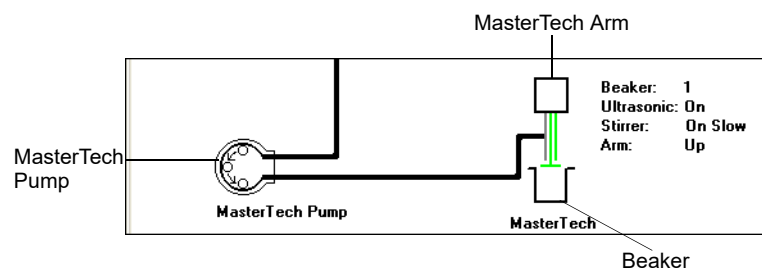


9. If the arm is in the Load position, press the ARM AUTO/LOAD switch on the front panel of the MasterTech to release it.
10. From the **Unit [n]** menu, select **Initialize MasterTech**.

A message is displayed indicating that initialization is in process. The tray on the MasterTech rotates in a counterclockwise direction for one position, and the arm lowers to the Rinse position and returns.

The tray then continues to rotate until position 1 is reached. The beaker inserted in the tray in Step 2 should now be directly under the head of the MasterTech. Make sure that the beaker contains approximately 80 mL of water.

11. On the instrument schematic, select the symbol representing the MasterTech arm.



When manual mode is enabled, components on the instrument schematic have pop-up menus displaying the options available for that component. Select the component, then click the right mouse button to access pop-up menus.

In each instruction for this step, first access the pop-up menu:

- a. Select **Move Arm Down**; then repeat the step.
  - b. Select **Ultrasonic On**; you will hear a high-pitched sound, indicating that the probe is operational. Now select **Ultrasonic Off**.
  - c. Select **Stirrer On**; the stirrer begins to operate.
  - d. Select **Speed**.
  - e. Select **Move Arm Up**.
  - f. Select **Stirrer Off**.
  - g. Select **Move Arm Up**.
  - h. Select **Move To Next Beaker**; note that the display is updated to reflect the position of the beaker tray. The picture on the screen should reflect whether or not a beaker is present.
12. Select the MasterTech pump. In each instruction in this step, first access the pop-up menu:
- a. Select **Turn On**; the MasterTech pump should begin operating (you will hear a whirring sound and the pump will begin to operate).
  - b. Check the direction of the flow of the MasterTech pump:  
  
Select **Flow Direction Load**; allows suspension to flow from the MasterTech to the SediGraph. This direction is used to load the sample into the mixing chamber of the SediGraph.  
  
Select **Flow Direction Rinse**; allows suspension to move from the SediGraph to the MasterTech. This direction is used to rinse the sample from the stirrer and transfer tube on the MasterTech.

This concludes verification of operation of the MasterTech. If everything performed as described above, the system should be fully operational. If you encountered any problems, refer to Chapter 9 for troubleshooting procedures.



# **M DATA FORMATS FOR UNREDUCED DATA REPORTS**



## DATA FORMAT FOR UNREDUCED DATA (OR RAW DATA) REPORTS

---

This appendix gives the format for sample files exported in ASCII text. All character strings are delimited with quotation marks; columns are separated with a comma and white space.

Data can be exported as:

- *Smoothed* (used in reports)
- *Unsmoothed* (collected by the instrument)
- *Raw* (time, height, and mass fraction)

The sizes and mass percents are computed from the raw data collected by the instrument per the formulas given in Appendix J.

Header information is displayed first as:

```

<sample type>           //integer, 1=Complete, 2=Analyzing, 4=Entered,
                        8=No Analysis
<sample ID>             //quoted string
<typed of data>         SMOOTHED or UNSMOOTHED or RAW
<instrument serial #>   //quoted string
<sample material>      //quoted string
<liquid>                //quoted string
  
```

After the header, the following are repeated for each test (analysis) contained in the sample file:

```

<blank line>
<test number>          //integer
<start time>           //quoted string
<end time>             //quoted string
<sample density>       //number (g/cc)
<liquid density>       //number (g/cc)
<liquid viscosity>     //number (cp)
<baseline>             //number (kilocounts/second)
<full scale>           //number (kilocounts/second)
  
```

The following apply to either Smoothed or Unsmoothed:

```
<size 1> <percent finer 1> //number (microns), number (fraction)
<size 2> <percent finer 2>
.
.
.
<size n> <percent finer n>
```

Instead of the previous information, Raw Data columns are displayed as:

```
<Height 1> <Time 1> <Counts 1> <Mass Percent 1> <Size 1>
<Height 2> <Time 2> <Counts 2> <Mass Percent 2> <Size 2>
.
.
.
<Height n> <Time n> <Counts n> <Mass Percent n> <Size n>
```

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# INDEX

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