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# **Saturn DigiSizer® 5200**

## **Operator's Manual V1.12**

**Part No. 520-42801-01  
March 2007**

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# CHAPTER 1

## **GENERAL INFORMATION**

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- Organization of the Manual
- Manual Conventions
- Equipment Description
- Windows Interface
- Specifications



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## GENERAL INFORMATION

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### Organization of the Manual

---

This manual describes the proper installation and operation of the Saturn DigiSizer Analysis System. To help you operate the Saturn DigiSizer more efficiently, step-by-step instructions of all operating procedures are provided in Chapter 4. Chapters 5, 6, 7, and 8 contain detailed information for the dialogs used while performing these procedures. Refer to these chapters if you need clarification on a procedure. Many of the procedures and dialogs also are accessible through online help.

The Saturn DigiSizer operator's manual is divided as follows:

- |                  |  |
|------------------|--|
| <b>Chapter 1</b> | <b>General Information.</b> Provides a general description of the Saturn DigiSizer system, its features, and specifications.         |
| <b>Chapter 2</b> | <b>Installation.</b> Describes how to unpack, inspect, install, and verify operation of the Saturn DigiSizer and the MasterTech 052. |
| <b>Chapter 3</b> | <b>User Interface.</b> Provides basic instrument and software interface.   |
| <b>Chapter 4</b> | <b>Operational Procedures.</b> Provides step-by-step procedures for the operations performed with the Saturn DigiSizer.              |
| <b>Chapter 5</b> | <b>File Menu.</b> Provides a description of the commands available from the File menu.   |
| <b>Chapter 6</b> | <b>Unit Menu.</b> Provides a description of the commands available from the Unit menu.   |
| <b>Chapter 7</b> | <b>Reports Menu.</b> Provides a description of the commands available from the Reports menu.   |
| <b>Chapter 8</b> | <b>Options Menu.</b> Provides a description of the commands available from the Options menu.   |
| <b>Chapter 9</b> | <b>Troubleshooting and Maintenance.</b> Provides user maintenance and service information.   |

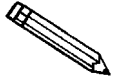
<b>Chapter 10</b>	<b>Ordering Information</b> Provides ordering information for the Saturn DigiSizer system components.
<b>Appendix A</b>	<b>Error Messages.</b> Lists the error messages displayed by the Saturn DigiSizer analysis program; includes a cause and action for each.
<b>Appendix B</b>	<b>Sample Dispersion and Sample Concentration.</b> Provides methods for dispersing samples and adjusting sample concentration.
<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>Liquid Density and Viscosity Data.</b> Provides density and viscosity data for common dispersants.
<b>Appendix E</b>	<b>Sources of Dispersing Aids.</b> Provides a list of suppliers for common dispersants.
<b>Appendix F</b>	<b>SediSperse Particle Dispersion Liquids.</b> Provides information on SediSperse dispersing liquids.
<b>Appendix G</b>	<b>Data Reduction.</b> Contains the calculations used for producing reports.
<b>Appendix H</b>	<b>Format of Exported Data.</b> Contains the format and a description of exported data.
<b>Appendix I</b>	<b>Attaching Multiple Analyzers to a Single Computer.</b> Provides instructions for attaching two analyzers to one computer.
<b>Appendix J</b>	<b>Background Quality.</b> Provides criteria for obtaining and determining an acceptable background.
<b>Appendix K</b>	<b>Low-Volume Sample Analyses.</b> Provides instructions for analyzing low-volume samples.
<b>Index</b>	Provides quick access to a subject matter.

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## Manual Conventions

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



**Notes contain 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.**

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## Safety Awareness

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Safety precautions and warnings are inserted throughout this manual in appropriate sections. It is important that you read and observe these precautions and warnings in order to prevent personal injury and/or damage to the instrument.

The Saturn DigiSizer uses a laser beam in its analysis process. Direct exposure to a laser beam can be hazardous. Therefore, for your protection, the Saturn DigiSizer contains an interlock safety device which disables laser operation if the analysis compartment is opened during an analysis. Do not, under any circumstances, attempt to override this safety interlock. Doing so may allow exposure to the laser beam at an intensity of up to 7 mW at 658 nm.



**Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.**

The Saturn DigiSizer is completely safe to operate. There is no danger of exposure to the laser beam when the Saturn DigiSizer is operated as directed in the operator's manual, and all cautions and warnings are observed.

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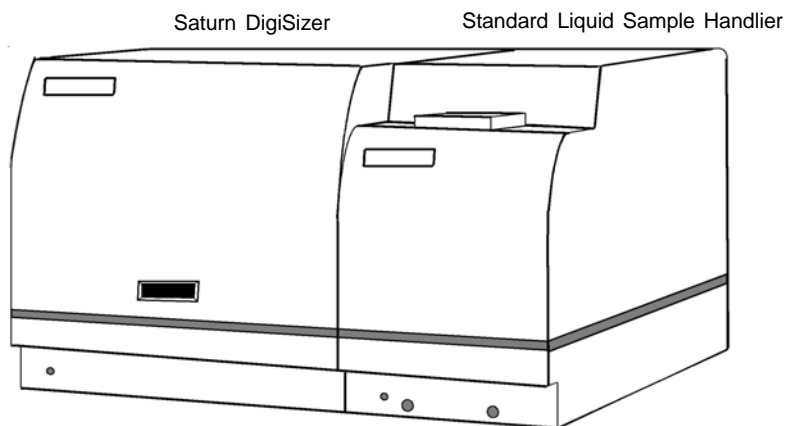
## Equipment Description

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### Saturn DigiSizer

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The Saturn DigiSizer 5200 System consists of up to two particle size analyzers, each with a liquid sample handler, and one multifunction personal computer. You can also install up to two MasterTech 052 Autosamplers allowing automatic analysis of up to 18 samples each.



*Figure 1-1. Saturn DigiSizer 5200 Analysis System*

The Saturn DigiSizer uses a laser in conjunction with a CCD (charge-coupled device) containing over one million detector elements to measure particle size. These detectors are placed so that they can measure the intensity of light scattered by the particles at various angles. Light is scattered by particles in a pattern dependent on their size, shape, refractive index, and wave length of incident light. Based on the Mie theory, the particle size distribution is calculated from the angle distribution of the scattered light intensity collected by the detectors.

Both organic and inorganic particles can be analyzed and measured over a range of 0.1 to 1000 micrometers. The Saturn DigiSizer includes a complete system for circulating the dispersing liquid/sample mixture through the cell and reservoir, as well as to an external waste container.

## Liquid Sample Handler

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The Saturn DigiSizer requires the use of a sample handler (shown with the DigiSizer in the previous illustration) to transfer the sample to the analyzer for analysis. The sample handler also allows for connection of an ultrasonic probe to assist in sample dispersion.

The sample handler enables automatic sample handling. All you have to do is define analysis conditions (in the sample file), add the sample to the reservoir (containing the dispersing liquid), and start the analysis. Your sample will be automatically monitored and diluted when necessary; and your system rinsed after each analysis (when specified in the sample file).

The Liquid Sample Handler is available in two configurations:

- **Standard unit:** includes a reservoir that holds 500 to 600 mL of dispersed sample. This model is best suited for samples containing coarse particles, or for those of high density.
- **Low-Volume unit:** includes a reservoir that holds 100 to 120 mL of dispersed sample. This model is best suited for analyses where the sample quantity or dispersion liquid is limited, or where the dispersion liquid may be hazardous or difficult to dispose of.

Included with both configurations is the capability of performing an analysis on a sample that has been predispersed in 7 mL of liquid. This capability is functional without the use of the liquid sample handler. The predispersed sample is loaded directly into the sample cell. Refer to Appendix K for instructions on performing this type of analysis.

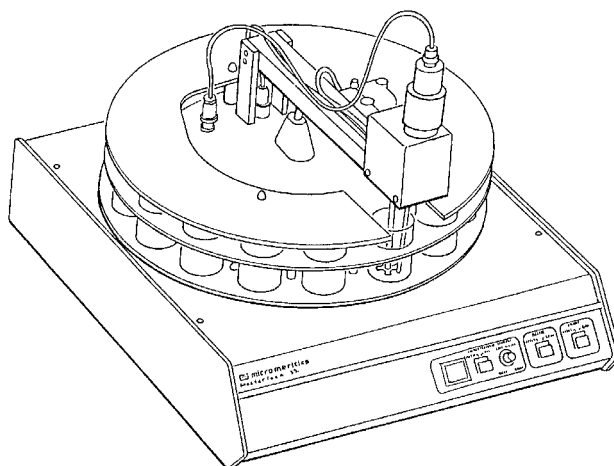
You also can attach a MasterTech 052 which allows you to analyze up to 18 samples sequentially without further intervention. The MasterTech automatically transfers each sample to the liquid sampler for analysis. A description of the MasterTech 052 is found in the following section.



## MasterTech 052

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The MasterTech 052 is an automatic sampling device that operates in conjunction with the Saturn DigiSizer. The MasterTech allows you to queue 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.



During operation, the beaker tray is loaded with beakers containing predispersed sample. When the Saturn DigiSizer is ready for a sample, the tray rotates until in the correct position for transfer. The sample is stirred for a user-specified length of time just before transfer to the Saturn DigiSizer for analysis. The ultrasonic probe can be activated to assist in redispersion if needed.

After redispersion, the sample is transferred to the reservoir of the analyzer. Then a small amount of analysis fluid is back-flushed to the MasterTech to rinse the stirrer, probe, and tubing. After rinsing is complete, the MasterTech prepares itself for the next sample. The next sample can be redispersed while analysis of the current sample is in progress. Analysis proceeds as if you had filled the reservoir manually with predispersed sample. After analysis of the current sample is complete, the contents of the reservoir are disposed to the waste container and the Saturn DigiSizer is rinsed. The system is now ready to transfer the next sample from the MasterTech.

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## Windows Interface

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The Saturn DigiSizer 5200 analysis program is designed to operate in the WindowsNT® (Version 4.00 or newer), Windows 2000, or Windows XP environment. It will not operate properly in other Windows environments.

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** in Chapter 3. For more specific instructions, refer to the Windows documentation or its online help system (accessible by selecting **Help** from the **Start** menu).

## Specifications

The Saturn DigiSizer Analysis System has been designed and tested to meet the specifications provided in Table 1-1.

*Table 1-1. Saturn DigiSizer Specifications*

Characteristic	Specification
<b>———— SATURN DIGISIZER SYSTEM ————</b>	
Laser	
Type:	Solid-state, Diode
Wavelength:	658 nm
Power output:	5 to 7.5 mW
Beam type:	Parallel
Beam width (in sample):	16 mm
	Certified under IEC 825 as a Class 1 laser product
Lens;	Focal length, 200 mm (fixed)
Detector	
Number of elements:	1,310,720
Geometry:	Rectangular array with 1280 x 1024 pixels used at 10 different angles to yield the equivalent of over 13 million elements
Alignment:	Automatic
Sample Circuit	
Circulation pump rate:	6 to 15 L/min (Standard sample handler); 2 to 12 L/min (Low-volume sample handler)
Circulation system volume:	500 to 600 cm <sup>3</sup> (Standard sample handler); 100 to 120 cm <sup>3</sup> (Low-volume sample handler)
Materials contacting sample:	Borosilicate glass; stainless steel; Tygon <sup>®</sup> (fuel grade) tubing; Titanium; Kel-F (CTFE); epoxy; Ertalyte <sup>®</sup> ; Neoprene; Buna-n and anodized aluminum (standard sample handler only); Viton <sup>®</sup> A and Kalrez (Low-volume sample handler only)

Characteristic	Specification
<b>Output</b>	
Measurement range:	0.1 to 1000 $\mu\text{m}$ Equivalent Spherical Diameter (Standard sample handler): 0.1 to 750 $\mu\text{m}$ (Low-volume sample handler)
Measurement time:	Less than five minutes, sample to sample
Size class range:	40 per decade for four decades
Deconvolution:	Mie theory and Fraunhofer theory models applied
<b>Performance</b>	
Accuracy:	0.1 to 1 $\mu\text{m}$ , 10% 1 to 1000 $\mu\text{m}$ , 3%
Resolution:	0.1 to 1 $\mu\text{m}$ , not applicable 1 to 1000 $\mu\text{m}$ , can resolve monosized particles separated by 20% in size
Repeatability:	0.1 to 1 $\mu\text{m}$ , 3% 1 to 1000 $\mu\text{m}$ , 1% (mean diameter for multiple analyses on the same instrument)
Reproducibility:	0.1 to 1 $\mu\text{m}$ , 5% 1 to 100 $\mu\text{m}$ , 2% 100 to 1000 $\mu\text{m}$ , 5% (particle size distribution, instrument to instrument)
<b>Voltage</b>	
Saturn DigiSizer:	100/115/220/240 VAC
Sample handler:	85 to 264 VAC
Frequency:	47 to 63 Hz
<b>Power</b>	
Saturn DigiSizer:	450 VA
Sample handler:	100 VA
Temperature:	Ambient +10 to 35 $^{\circ}\text{C}$ , operating; -10 to 55 $^{\circ}\text{C}$ , storing or shipping
Humidity:	Up to 90% (non-condensing)

Characteristic	Specification
<b>Physical</b>	
Saturn DigiSizer:	Height: 50 cm (19.7 in.) Width: 47 cm (18.5 in.) Depth: 65 cm (25.6 in.) Weight: 45 kg (99 lbs)
Sample handler:	Height: 50 cm (19.7 in.) Width: 27.5 cm (10.8 in.) Depth: 65 cm (25.6 in.) Weight: 29 kg (78 lbs)
<b>————— COMPUTER —————</b>	
Minimum requirements:	Pentium 333 MHz or equivalent Ethernet card One CD ROM drive 128 megabytes of RAM 1-gigabyte hard drive 800 x 600 video display capability WindowsNT (V4.00 with a minimum of Service Pack 4), Windows 2000, or Windows XP Professional
<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, SediSpense <sup>®</sup> , and mineral spirits)
Wetted Materials:	Stainless steel, Viton, Tygon, silicone rubber, polypropylene

Characteristic	Specification
Voltage:	100, 120, 220 or 240 VAC $\pm$ 10%
Fuse:	2A (100/120VAC); 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)

## **CHAPTER 2**

# **INSTALLATION**

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- Unpacking and Inspecting the Equipment
- Installing the Saturn DigiSizer System
- Installing the MasterTech 052





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## INSTALLATION

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This chapter describes how to:

- Unpack and inspect the equipment
- Install the Saturn DigiSizer system
- Verify operation of the Saturn DigiSizer system
- Install the MasterTech
- Verify operation of the MasterTech

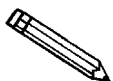
Initially, your Saturn DigiSizer will be installed and verified for operation by an authorized Micromeritics service representative or a representative of a Micromeritics distributor. The installation instructions provided in this chapter are to be used when the Saturn DigiSizer has been relocated or reinstalled after a factory repair.

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### Unpacking and Inspecting the Equipment

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When you receive the shipping cartons, carefully compare the packing list with the equipment actually received and check the equipment for any damage during shipment. Be sure to sift through all packing materials before declaring equipment missing.



**If you need to declare equipment as damaged or lost, save the shipping cartons. The claims investigator must examine the cartons in order to complete the inspection report.**

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### Lifting the Analyzer

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The Saturn DigiSizer analyzer weighs 45 kg (99 lbs) and requires the use of two people to lift it from its shipping carton. One person should **not** attempt to lift the analyzer. With one person on each side of the analyzer, lift it upright from its shipping carton. Place the analyzer on a table top of sufficient space.



**Use proper lifting techniques to avoid back injury.**

## Equipment Damage or Loss During Shipment

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If equipment is damaged or lost in transit, make note of the damage or loss on the freight bill. The freight carrier, not Micromeritics, is responsible for all damage or loss occurring during shipment. If you discover damage or loss of equipment during shipment, report the condition to the carrier immediately.

## Equipment Return

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Micromeritics strives to ensure that all items arrive safely and in working order. Occasionally, due to circumstances beyond our control, a customer may receive equipment which is not in working order. When equipment has been damaged (either during shipment or in use) and you wish to return the equipment to Micromeritics for repair or replacement, follow the steps below:

1. Pack the instrument in its original shipping carton if possible. If the original carton is unavailable, for a nominal fee Micromeritics can provide another carton for your use.

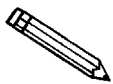


**Failure to package your instrument properly may result in shipping damage.**

2. Tag or otherwise identify the defective equipment, noting the defect and, if possible, the circumstances under which the defect occurred.
3. Reference the sales order or purchase order number for the equipment, and provide the date the equipment was received.
4. Notify the Micromeritics Service Department of the defect and request shipping instructions. The Service Department will assign a Returned Materials Authorization (RMA) number. Write the RMA number on the outside of the carton.

## Installing the Saturn DigiSizer System

Initial installation of your Saturn DigiSizer is performed by a Micromeritics Service Representative. The instructions provided here are for reinstalling the analyzer should it become necessary to move it from its present location.



**Chapter 3 provides a description and location of the controls and indicators located on the front and rear panels of the analyzer and the liquid sample handler.**

### Selecting the Voltage

#### Saturn DigiSizer

The Saturn DigiSizer 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(s) installed before the analyzer can be operated. The Saturn DigiSizer is designed to operate with 100, 120, 220, or 240 VAC at 50 or 60 Hz. Voltage selection and fusing are made at the power connector located on the rear panel of the analyzer. Appropriate fuses are included in the accessories kit:

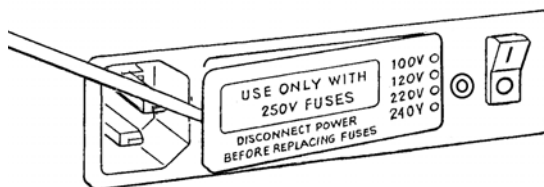
- Two 5 x 20 mm, 3.15 Amp when selecting for 200-240 VAC
- one 3AG, 5.0 Amp when selecting for 100-120 VAC

Spare fuses are also included.

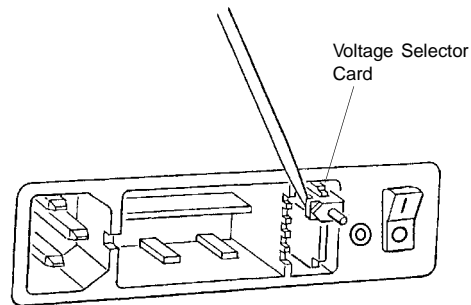


**The power cord should be disconnected from the analyzer before removing the cover from the power input connector. Failure to disconnect the power cord could result in electrical shock.**

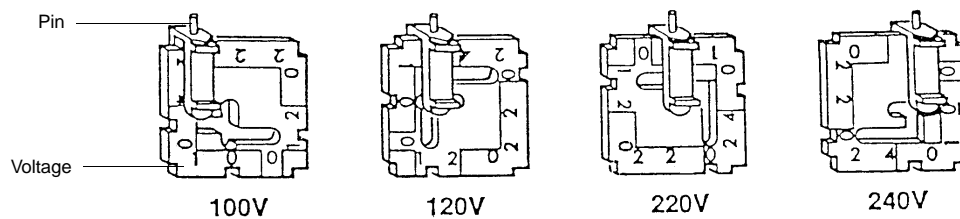
1. Make sure the power cord is disconnected from the analyzer.
2. Check the voltage setting on the rear panel of the analyzer; if the voltage is at the correct setting, skip to Step 9.
3. Using a pointed object, remove the fuse block and cover assembly from the power connector at the rear of the analyzer.



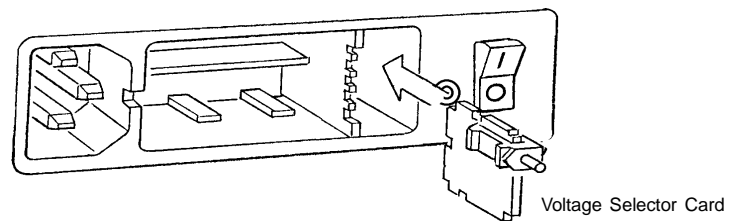
- Pull the voltage selector card straight out of the power connector housing.



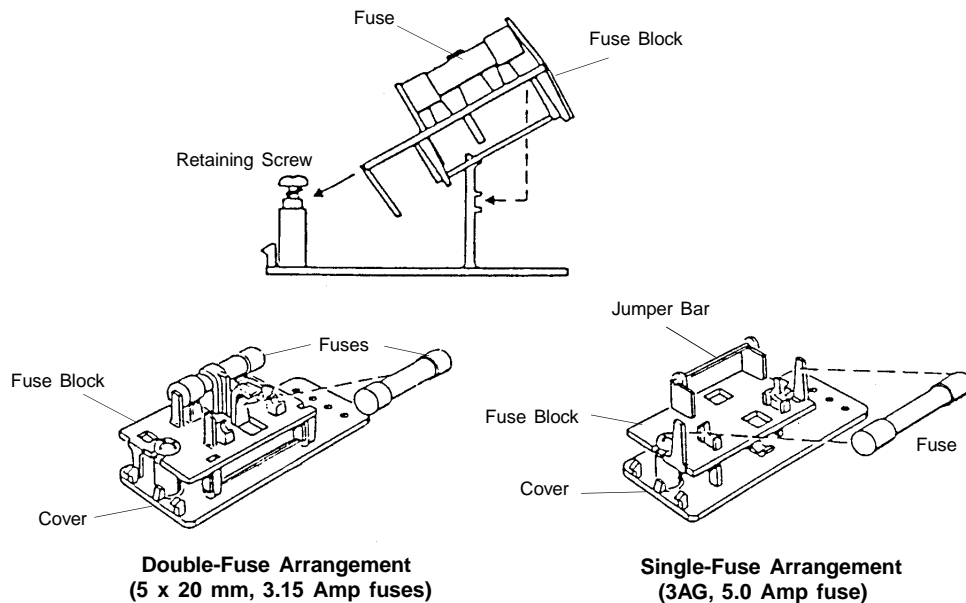
- Orient the voltage selector card so that the desired voltage is indicated at the bottom. Orient the indicator pin so that it points upward as shown in the following illustration.



- 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 cord connector.



7. 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 double-fuse arrangement is most commonly used for 200-240 VAC; two 5 x 20 mm fuses are included in the accessories kit for this purpose. A 3AG, 5 Amp fuse is included for the single-fuse arrangement which is most commonly used for 100-120 VAC.



**The power cord should be disconnected from the analyzer 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.

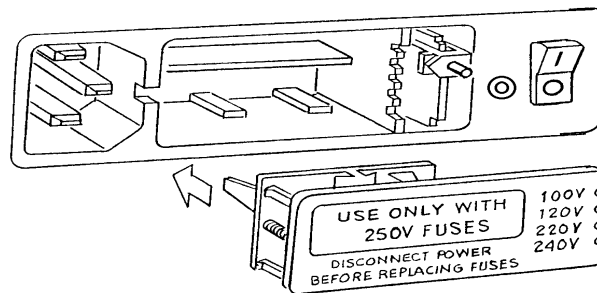
- 3) Rotate the fuse block.
  - 4) Mount the fuse block to the cover.
  - 5) Replace the retaining screw.
- c. Insert appropriate fuse(s) for the input power source. Refer to the chart below for the appropriate fuse rating.



**The fuses used in the analyzer must be identical in type and rating to that specified. Use of other fuses could result in electrical shock and/or damage to the unit.**

<u>Power Source</u>	<u>Fuse</u>
100-120 VAC	3AG, 5.0 Amp Slow-Blow
200-240 VAC	5 x 20 mm, 3.15 Amp Slow-Blow

8. Insert fuse block and cover assembly into input power connector (as shown in the following illustration) and snap it into place. After the fuse block and cover assembly are in place, the position of the indicator pin shows the input power selected.



9. Connect the power cord to the analyzer and plug into an appropriate power source.

## Computer

The line voltage of the computer must be set to match the input power source (from the wall outlet). The computer operates with either 100-120 VAC or 200-240 VAC at 50 or 60 Hz. Refer to the instruction manual supplied with your computer for instructions on selecting power input.



**Do not connect the computer power cord to a power source until the proper voltage selection is made. Doing so could result in electrical shock and/or damage to the computer.**

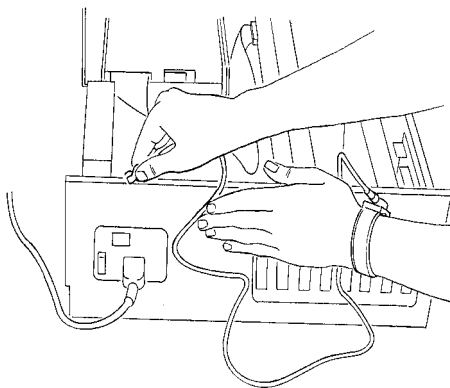
## Installing the Ethernet Card

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The ethernet card allows communication between the DigiSizer and the computer.

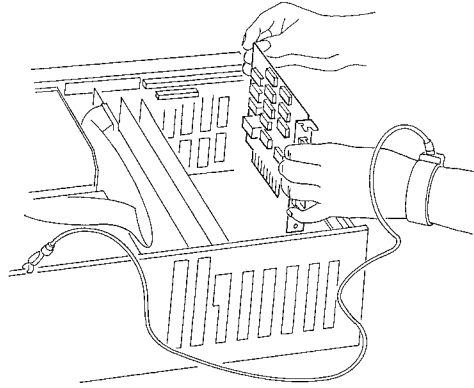
To install the ethernet card:

1. Remove the cover from the computer.
2. There are expansion slots located on the rear panel of the computer. Some of these slots are used by the manufacturer, others are available for your use. Select one of the available slots for installation of the ethernet card.
3. Remove the screw that holds the expansion slot cover in place and retain it for installation of the ethernet card. Remove the cover.
4. Insert one end of the computer power cord into the power input receptacle at the rear of the computer and the other end into an appropriate power source; **DO NOT** turn on the computer. After the computer is connected to the power source, it should provide the appropriate ground connection for the next step.
5. Before removing the ethernet card from the anti-static bag, remove all jewelry from your hands and wrists. Attach the wrist-band end of a ground strap to your wrist and the other end to the chassis of the computer.



6. Remove the ethernet card from the anti-static bag.

7. Hold the card by the edges only and carefully insert it into the expansion slot. Make sure the card is fully seated in the slot.

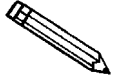


8. Insert the screw you removed from the expansion slot cover and tighten.
9. Replace the computer chassis cover.

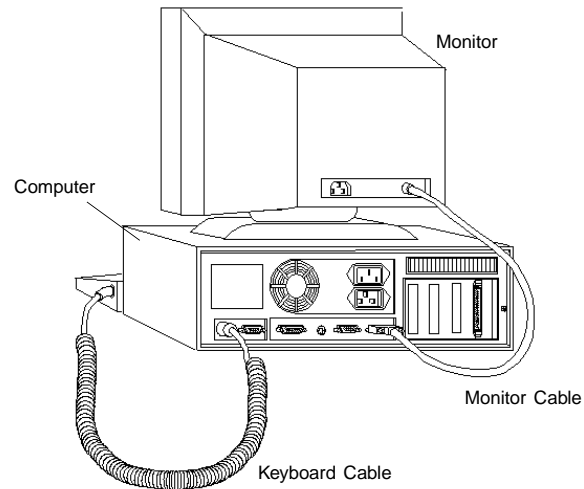


## Connecting Peripheral Equipment to the Computer

Follow the instructions provided below to connect the monitor, keyboard, printer, and mouse. The following illustration shows typical connections.



Refer to the instruction manuals supplied with the computer, video monitor, and printer for voltage requirements for these units.



1. Plug the keyboard cable, the monitor cable, and the mouse cable into their respective connectors on the rear panel of the computer.
2. Plug one end of the printer cable into the connector on the rear panel of the printer. Plug the other end of the printer cable into the connector labeled **LPT1** (may be labeled **PARALLEL**) on the rear panel of the computer.
3. Plug all power cords into an appropriate power source.

## Connecting the Ethernet Cable

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The ethernet crossover cable has RJ45 connectors (similar to a phone jack). Install the cable as follows:

1. Insert one end of the Ethernet cable into the connector labeled **Ethernet** on the rear panel of the analyzer.
2. Insert the other end of the cable into the RJ45 connector on the ethernet card (exposed on the rear panel of the computer).

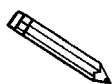
## Configuring the Ethernet Card

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After the ethernet connection has been made, the ethernet card must be configured to allow communication between the computer and the analyzer.

These instructions are for configuring Unit #1. If two analyzers are being installed on one computer, refer to Appendix I for configuring the second unit (after installation of the first one).

Turn on the computer, start your Windows program, and proceed with the instructions applicable for your Windows environment.



**The IP address for the ethernet card can be entered only by your network administrator or someone with administrator rights.**

## Windows NT

---

1. Select **Start, Settings, Control Panel**; the Control Panel window is displayed.
2. Double-click on the **Network** icon; the Network dialog is displayed.
3. Select the **Protocols** tab.

If the TCP/IP protocol is installed, go to Step 4. If the TCP/IP protocol is not installed, perform the following steps before going to Step 4:

- a. Click **Add**; the Select Network Component dialog is displayed.
  - b. Select **TCP/IP Protocol**.
  - c. Click **OK**.
4. Select TCP/IP Protocol, then click **Properties**; The Microsoft TCP/IP Protocol dialog is displayed.

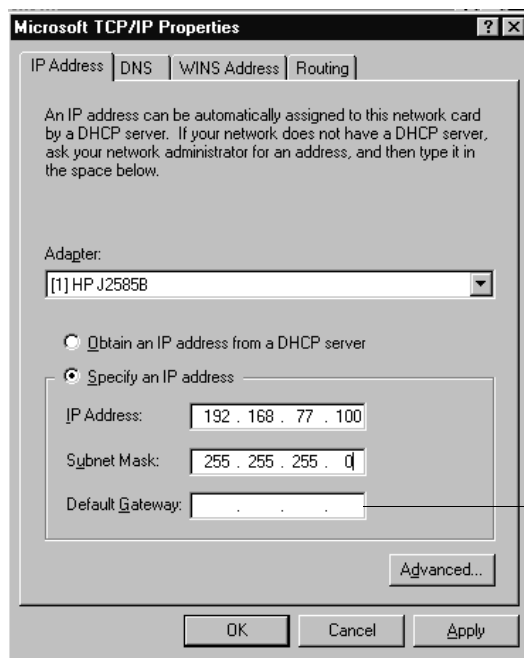
5. Select the **IP Address** tab.
6. Ensure that the Ethernet card description is displayed in the **Adapter** field. Unless you have installed other Ethernet cards, the current one should be displayed and the only one in the drop-down list. If you have other Ethernet cards installed, be sure that you choose the correct one (refer to the documentation included with the Ethernet card).
7. Choose **Specify an IP address**.
8. In the **IP address** field, type:

192.168.77.100

In the **Subnet Mask** field, type:

255.255.255.0

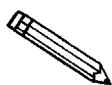
The **Default Gateway** field does not require an entry.



9. Click **OK** to close the TCP/IP Properties dialog and then again to close the Network dialog. You will be prompted to restart Windows to apply the changes.
10. Restart Windows.

## Windows XP and Windows 2000

1. Access the Windows Control Panel.
2. **Windows XP users:** click **Network Connections**.  
**Windows 2000 users:** click **Network and Dial-Up Connections**.
3. Double-click on **Local Area Connection**; the Local Area connection Status dialog is displayed. Be sure to choose the connection designated for the DigiSizer.
4. Select the **General** tab, then click **Properties**; the Local Area Connection Properties dialog is displayed.
5. Ensure that **TCP/IP Protocol** is displayed in the list and is checked.



**If TCP/IP Protocol is not displayed, it must be installed before proceeding. Click **Install** to install TCP/IP Protocol.**

6. Highlight Internet Protocol (TCP/IP), then click **Properties**.
7. Click the **General** tab; the Internet Protocol (TCP/IP) Properties dialog is displayed.

Do not type anything in this field.

8. Choose **Use the following IP address:** and enter the following:

**IP address:** 192.168.77.100  
**Subnet Mask:** 255.255.255.0  
**Default Gateway:** does not require an entry

9. Click **OK**, **OK**, then **Close** to close the subsequent dialogs.

## Installing the Analysis Program

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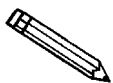
Your system must meet or exceed the following requirements before you can install the Saturn DigiSizer analysis program:

- Pentium 333 MHz computer (or equivalent)
- 128 megabytes of main memory and 200 megabytes of free disk space
- WindowsNT (Version 4.00 with a minimum of Service Pack 4), Windows 2000, or Windows XP Professional
- CD-ROM drive
- 3½-in. disk drive
- SVGA monitor (800 x 600, minimum resolution)

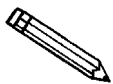
You can also install the 5200 analysis program for offline data manipulation on a computer other than the one controlling the analyzer. This allows you to:

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

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



**Power management features should be disabled so that Micromeritics applications can communicate properly with the instrument during operation. These features can be disabled in the computer setup configuration or through a utility supplied by your computer manufacturer.**



**It is recommended that you close all programs before beginning installation of the Saturn DigiSizer software.**

### Initial Installation

---

The Saturn DigiSizer analysis program is supplied on a CD. Install the program as follows:

1. Turn on the analyzer and the liquid sample handler.
2. Insert the Saturn DigiSizer CD into the CD-ROM drive.
3. Select **Start** from the Status bar.
4. Select **Run** from the Start menu.

- Enter the drive designator for the CD-ROM, followed by **SETUP**.  
For example:

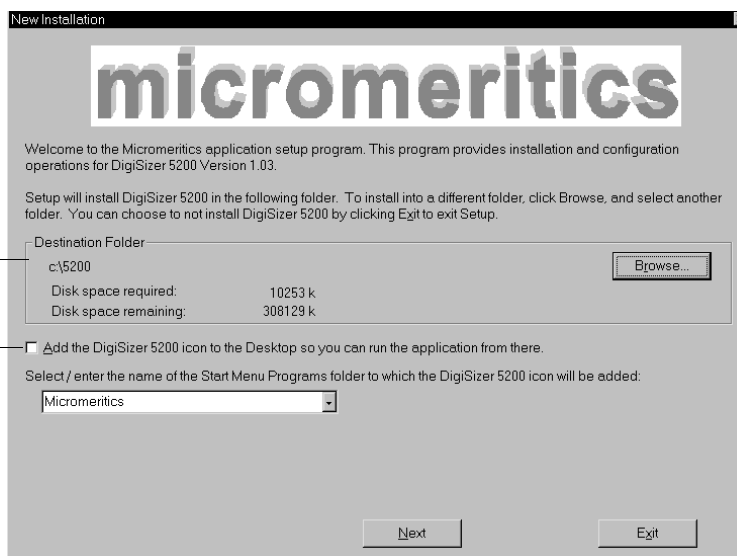
**e:setup**

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

- Click **OK** ; the New Installation dialog is displayed.

Displays the amount of current disk space and the amount required for installation of the application. Also displays the directory into which the application will be installed.

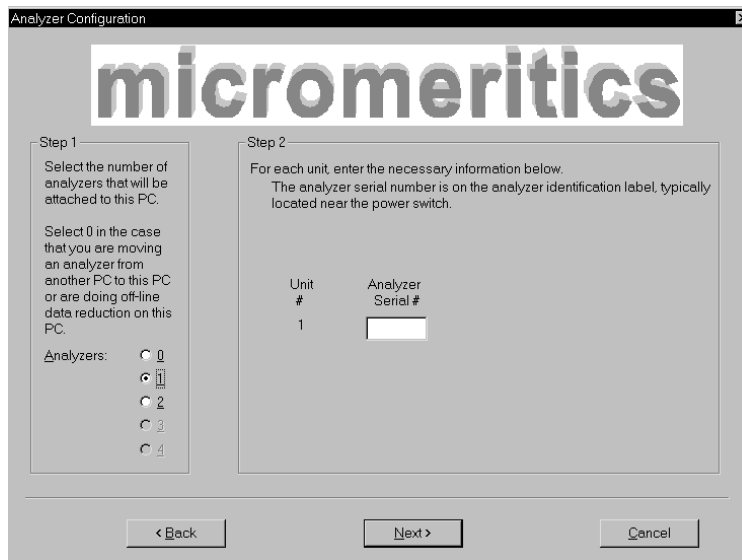
Select this option to add the Saturn DigiSizer icon to your desktop.



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

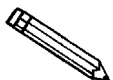
- If you want to run the application from the desktop, select the checkbox just below the Destination Folder group box to add an icon.
- The DigiSizer icon will be added to the Micromeritics folder by default. If you prefer a different folder, enter or select one from the drop-down list.

9. Click **Next >>** ; the Analyzer Configuration dialog is displayed.



- a. In the **Step 1** group box:

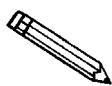
If...	Then...
you are installing the analysis program at initial installation:	select <b>1</b> for the number of analyzers, even when installing two analyzers. (After installation of the first analyzer, refer to Appendix I for installing the second one.)
you are reinstalling the analysis program on a new computer:	select the actual number of analyzers to be operated with this computer. (Refer to Appendix I for instructions on completing installation of two analyzers.)
you plan to use the analysis program for offline data reduction:	select <b>0</b>
you are moving an analyzer from another computer to this one:	select <b>0</b>



**Additional hardware is required if you plan to attach two DigiSizers to one computer. Refer to Appendix I for information on attaching two analyzers.**

- b. In the **Step 2** group box, enter the serial number(s) for the analyzer(s) you are attaching to this computer.

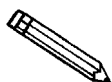
10. Click **Next >>**; the Calibration File Installation dialog is displayed. Read the information displayed on each dialog and proceed accordingly.



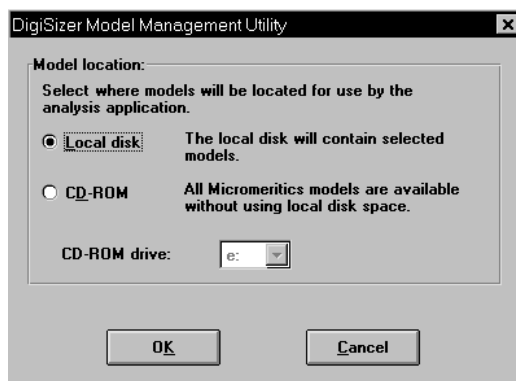
**If you selected 0 as the number of instruments to install, calibration information is not required. The analysis program will install and the model management utility displayed for installation of models.**

11. Click **Next >>**; the Model Management dialog is displayed. Models are collections of data detailing how light is scattered by particles of differing sizes made of a given substance in the liquid chosen to disperse them. Models are used to translate the measured light-scattering pattern into a particle size distribution.

12. Click **Next >>**; the DigiSizer Model Management Utility dialog is displayed.



**You can also install models using the *Model management* command on the Options menu in the analysis program. Click **Skip** if you prefer to install the models at a later time.**



### Local disk

Allows you to install models to your local drive or to remove models already installed on the local drive. New models can be generated using the **Options** push button on the Materials properties dialog (refer to Chapter 5 for additional information).

If you choose to install the models on your local drive, keep in mind that each model uses 1.2 MB of disk space.

Proceed to Step 14 for the **Local disk** option.



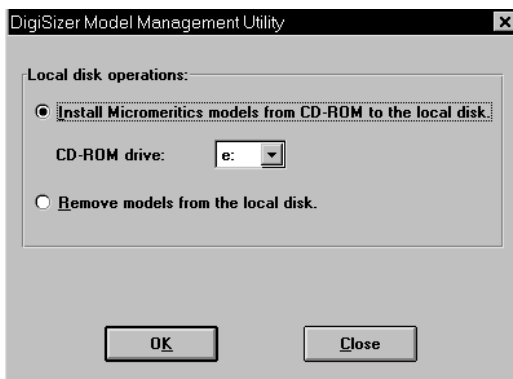
**CD-ROM**

Allows you to access the models from the CD-ROM drive so that you do not have to use disk space on your local drive. Use the drop-down list to select the drive designator for the CD-ROM drive.

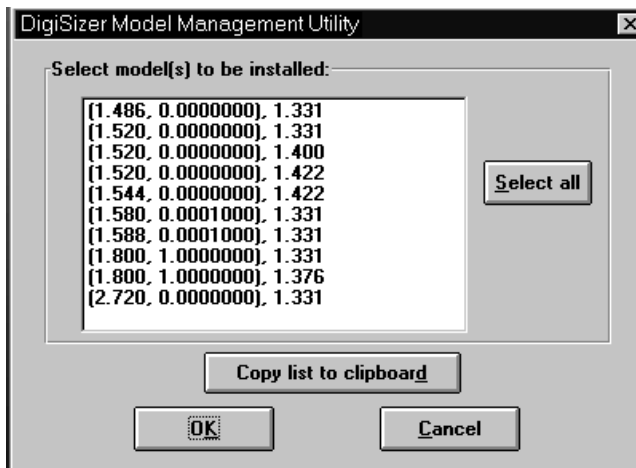
If you choose to use this option, be sure that the CD-ROM is in the drive when the analysis program is in use.

Proceed to Step 15 for the **CD-ROM** option.

13. To install the models on your local drive:
  - a. Choose **Local disk**; this dialog is displayed.



- b. Choose **Install Micromeritics models from CD-ROM to the local disk**. Ensure that the appropriate drive designator is displayed as the CD-ROM drive, then click **OK**; a dialog containing the current models is displayed.



- c. Click  to install all models. Alternatively, you can click on the models you wish to install while holding down the  key.
  - d. Click  to copy the models to your local hard disk; each model uses approximately 1.2 MB of disk space. After selected models are installed, a dialog confirming the number of models installed is displayed.
  - e. Click ; the Install Complete dialog containing the Readme file is displayed.
  - f. Click ; a dialog informing you to restart Windows may display; if so, select  to have the system restart Windows.
14. To use the models from your CD-ROM drive:
    - a. Choose **CD-ROM**; ensure that the correct drive designator is displayed. Be sure to have your analysis program CD inserted in the CD-ROM drive when the analysis program is in use.
    - b. Click ; the Install Complete dialog containing the Readme file is displayed..
  15. Click  to close the dialog.
  16. Remove the program CD and store in a safe place. The original program CD contains the calibration files specific to your instrument. Upgrade CDs do not contain calibration files. Therefore, it is important that you maintain your original program CD in a secure location in the event calibration files need to be reinstalled.
  17. Record the date and analyzer statistics on the Saturn DigiSizer Configuration form located at the back of Appendix I:
    - a. Select **Start, Programs, WIN5200** to start the analysis program.
    - b. Select **Unit Configuration** from the **Unit [n]** menu.
    - c. Record the unit number (located in the title bar of the dialog).
    - d. Record the serial number and the IP address (displayed in the configuration group box).
    - e. Click  and record the subnet mask (the series of numbers on the third line of the IP Setup dialog). Then click  to close the dialog.
    - f. Click  to close the Unit Configuration dialog.

## Subsequent Installation

After initial installation of the DigiSizer analysis program, the application setup program can be used to:

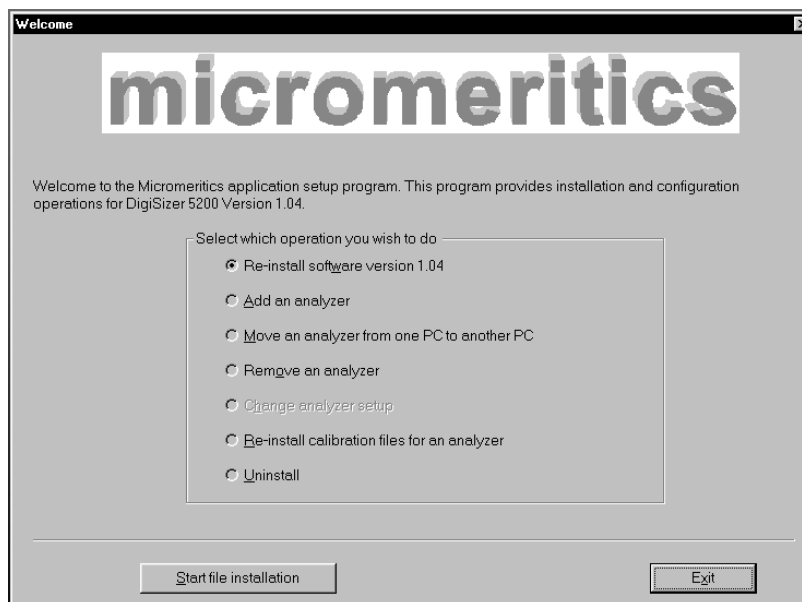
- Upgrade software
- Add an analyzer
- Move an analyzer from one computer to another one
- Remove an analyzer
- Reinstall calibration files for an analyzer
- Uninstall the analysis program

To run the application setup program:

1. Ensure that the *analysis program* is not operating.
2. Insert the 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  , navigate to your CD-ROM drive, and select **setup.exe**.

6. Click  ; the Setup Welcome screen showing the options available is displayed.



## Installing Subsequent 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 cases for this operation; 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 selections in the Setup dialog accordingly.

1. In the Setup dialog, 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)**
2. Click . The application installs the software and redisplay the Setup Welcome dialog. If no other operations are desired from this dialog, click  to close the dialog.

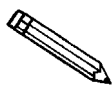
## Adding an Analyzer

You can install two analyzers to operate on one computer.

Refer to Appendix I for complete hardware/software instructions.

## Moving an Analyzer from One Computer to Another Computer

An analyzer and its calibration files can be moved from one computer (Source PC) to another computer (Destination PC).



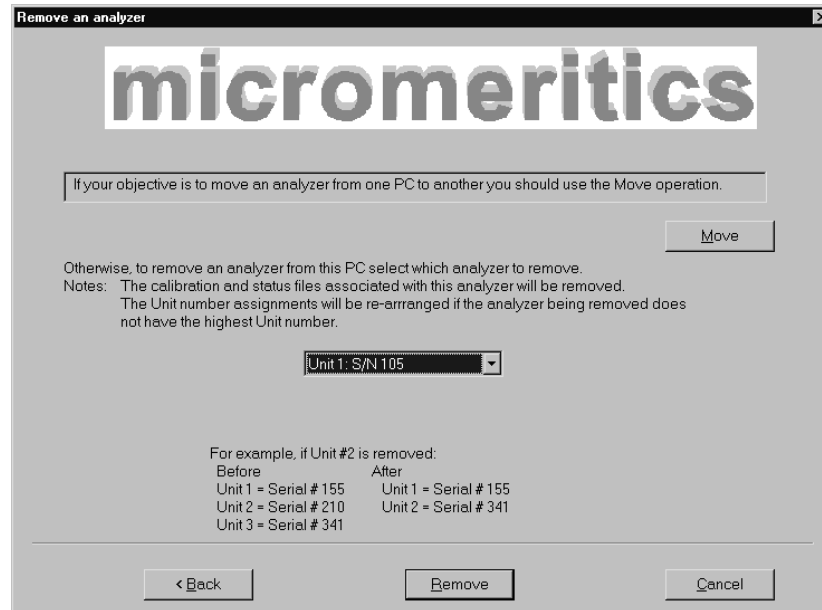
**This operation does not move sample or parameter files. Use a file management program such as Explorer or a backup/restore utility to move these files.**

Refer to Appendix I for complete hardware/software instructions.

## Removing an Analyzer

You can remove an analyzer from the system as follows. When you do so, the system removes the calibration and status files from the computer.

1. Run the Setup program. From the Setup dialog, select **Remove an analyzer**, then click **Next >>** ; the Remove an analyzer dialog is displayed.

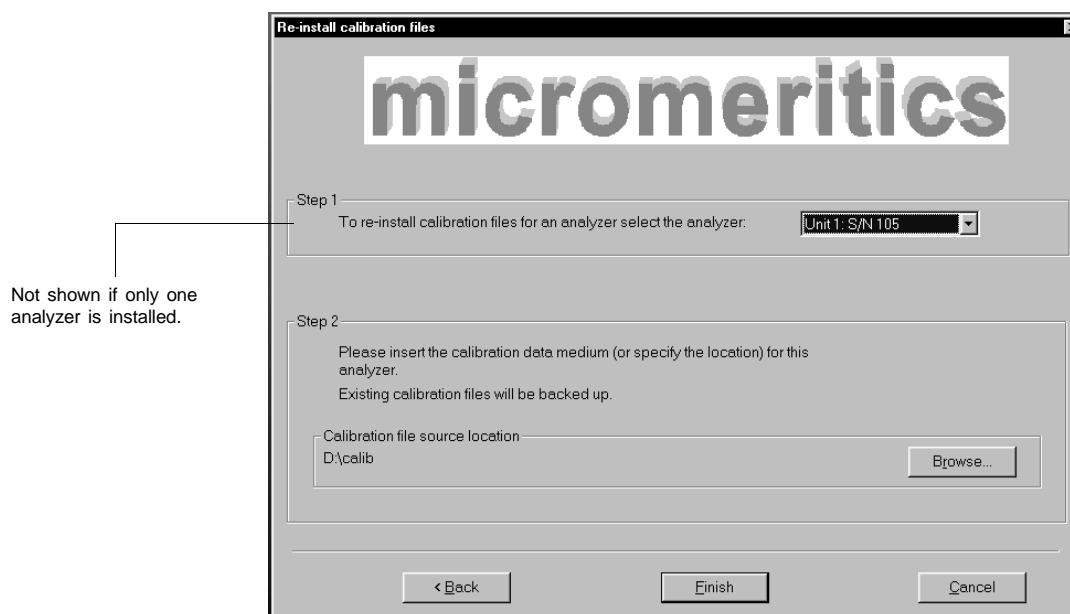


2. From the drop-down list, choose the serial number of the analyzer you want to remove.
3. Click **Remove** ; the analyzer is removed and the Welcome screen is again displayed.
4. Click **Exit** to close the dialog.

## Reinstalling the Calibration Files

You can reinstall the files containing an analyzer's factory calibration data as follows:

1. Run the Setup program. From the Setup dialog, select **Re-install calibration files for an analyzer**, then click **Next >>**; the Re-install calibration files dialog is displayed.

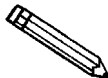


2. Select the analyzer whose calibration files you want to reinstall from the drop-down list. If you have only one analyzer installed, a drop-down list is not included.
3. Insert the CD containing the calibration files; ensure that the CD drive is displayed as the Calibration file source location. If not, click **Browse** and choose the CD drive.
4. Click **Finish**; the calibration files are reinstalled and the Welcome dialog is again displayed.
5. Click **Exit** to close the dialog.

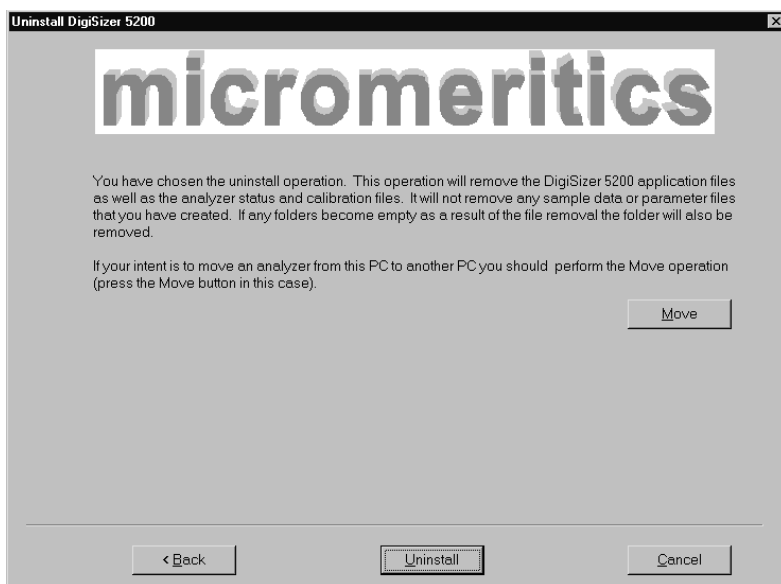
## Uninstalling the Analysis Program

You can remove the DigiSizer analysis program as follows. When you perform this operation, the application removes the analysis program, status files, analyzer setup files, and resulting empty directories. It does not remove data files.

1. Run the Setup program. From the Setup dialog, select **Uninstall**, then click **Next >>**; the Uninstall dialog is displayed.



You can also use the Add/Remove Programs option on the Windows control Panel to uninstall the DigiSizer analysis program.



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



3. Choose one of the following:
  - **Automatic:** click ; the system uninstalls the DigiSizer software automatically and the Setup Welcome window redisplay.
  - **Custom:** click ; 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 window redisplay.
4. Click  to close the Welcome window.



## Connecting the Liquid Sample Handler

A liquid sample handler is required to transfer the sample to the analyzer for analysis. The sample is transferred through the use of tubing. This tubing is installed on the left side of the sample handler and inserted through two ports on the right side of the analyzer. Precut tubing is provided for this purpose; if you are installing the:

- Standard unit, the tubing is 1.27-cm (1/2-in.) diameter (2 pieces)
- Low-volume unit, the tubing is 0.79-cm (5/16-in.) diameter (1 piece)

Perform the following steps to install the liquid sample handler.

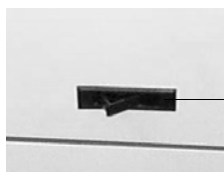
1. Remove the two plugs from the ports on the side of the sample handler.
  - If you are installing the Low-volume unit, the tubing on the upper port is installed; remove the plug from the end of the tubing.
2. Install the tubing onto the connectors provided on the left side of the liquid sample handler. One piece of tubing is approximately 2 inches longer than the other; install this piece on the upper connector and the shorter one on the lower connector.

Longer piece on upper port.  
This piece of tubing is already installed if you have the Low-volume unit.

Shorter piece on lower port.

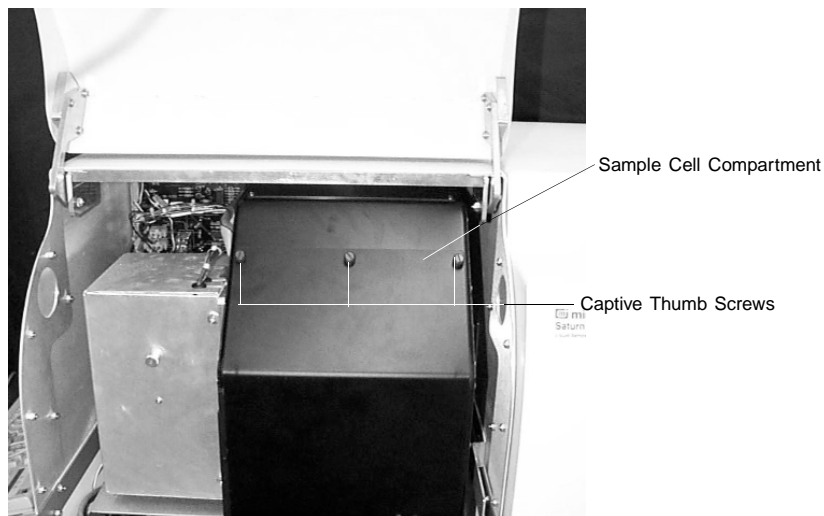


3. Open the front panel of the analyzer.
  - a. The front panel contains a retractable handle; press on the right side to protract the handle.

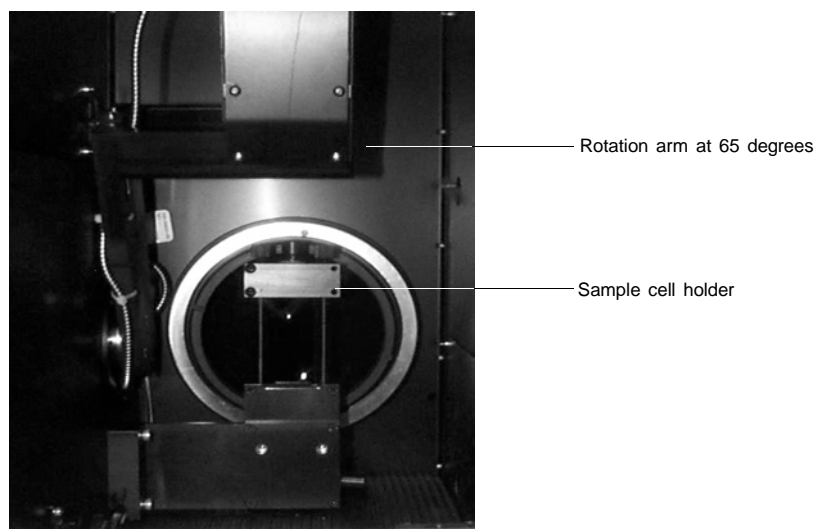


- b. Grasp the handle and lift upward to open the front panel.

4. The cover of the sample cell compartment is held in place by three captive, thumb screws. Turn each screw counterclockwise and remove the cover.



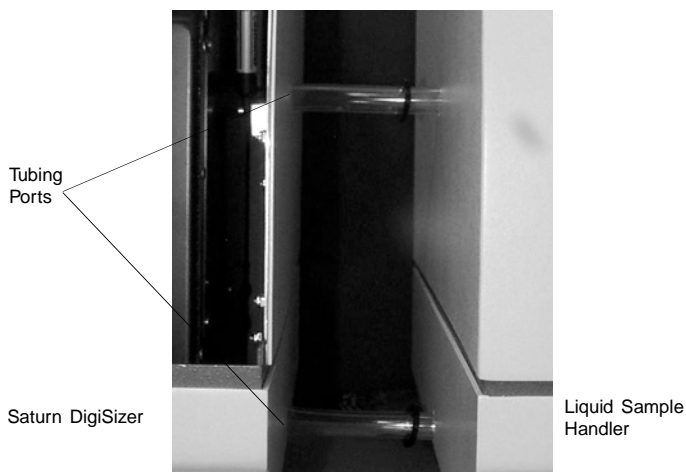
5. Remove the foam block supporting the rotation arm. The rotation arm should be elevated and out of the way of the sample cell holder.



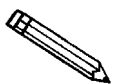
If the rotation arm is blocking access to the sample cell holder, perform the following steps to move it:

- a. Close the front panel; for safety reasons, the rotation arm will not move if the front panel is open. You do not have to replace the cover on the sample cell compartment.
- b. Turn on the analyzer.
- c. Select **Start, Programs, Micromeritics, WIN 5200** to start the analysis program.

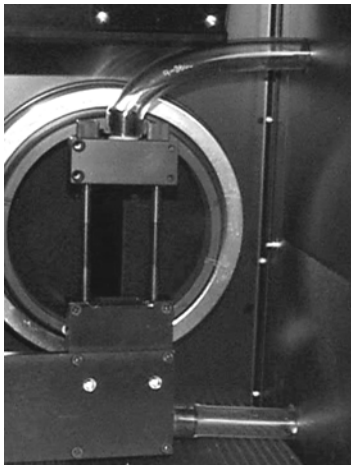
- d. If the instrument schematic is not shown, select **Show instrument schematic** from the **Unit** menu. (Chapter 6 provides a description of the schematic and its components.)
  - e. Select **Enable manual control** from the **Unit** menu.
  - f. Right-click on the rotation arm (☐) and select **Move**.
  - g. Select **Angle** and type 65 in the **degrees** field.
  - h. Click ; the rotation arm will start to move.
  - i. After the arm stops moving (65.0000 will display to the upper right of the rotation arm on the schematic), open the front panel.
  - j. Exit the analysis program, turn off the analyzer, and proceed with the next step.
6. Remove the plugs from the ports on the inside, right side of the analyzer to allow installation of the sample transfer tubing.
  7. Place the liquid sample handler to the right side of the analyzer.
  8. Slide the liquid sample handler toward the analyzer, guiding the tubing through the ports on the right side of the analyzer.



9. Attach the sample transfer tubing to the sample cell holder as shown below.



**Avoid touching the lens when installing the tubing. Dirty, or smudged optics, will affect analysis results.**



10. Attach the RS232 communications cable as follows:
  - a. Connect one end of the cable to the port labeled **RS232 From Saturn Analyzer** on the rear panel of the liquid sample handling unit.
  - b. Connect the other end of the cable to the port labeled **Sample Handling Unit RS232** on the rear panel of the analyzer.
11. Plug the liquid sample handler's power cord into an appropriate power source. The liquid sample handler is equipped with universal power input; therefore, voltage selection is unnecessary.

## Installing the Sample Cell

The sample cell should always be kept clean to ensure collection of accurate data. Observe the following precautions when handling the sample cell:

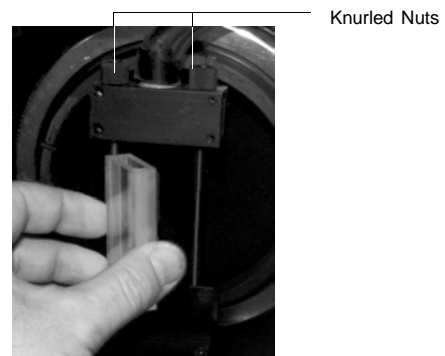
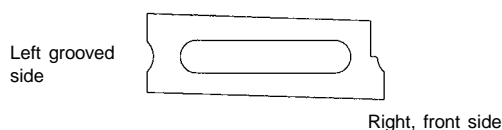
- Avoid touching the smooth surfaces of the sample cell; always hold the cell by the edges
- Never place the sample cell on anything other than a lens paper (a supply of lens papers is provided in the accessories kit)
- Periodically remove and inspect the sample cell for cleanliness; clean if necessary (refer to **Cleaning the Optics** in Chapter 9)
- Handle the sample cell carefully to avoid replacement costs



**The sample cell is coated with an anti-reflective substance. Be careful not to scratch this coating. Also avoid touching the front and back surfaces of the sample cell to prevent fingerprints.**

Follow the instructions provided below to install the sample cell into the sample cell holder.

1. Loosen the two knurled nuts on the top bracket of the sample cell holder. Then pull up on the bracket to allow placement of the sample cell.
2. Remove the sample cell from its container.
3. The sample cell is grooved on the left side and angled slightly on the right, front side. Holding the sample cell by the edges, slide the grooved (left) side of the cell onto the left vertical bar.

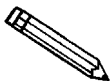


4. Swing the sample cell into place (against the right vertical bar).
5. Slide the top bracket of the sample cell holder down.
6. Tighten the knurled nuts.

## Installing the Liquid Sample Handler Tubing

The following items for installing the tubing are provided in the accessories kit:

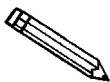
- Appropriate plastic containers for the analysis, rinse, overflow, and waste (drain) liquids
- Precut pieces of Tygon tubing for the analysis, rinse, overflow, and drain functions



**The Low-volume unit uses the same liquid for analysis and rinsing. Therefore, it does not require attachment of rinse tubing, nor use of a separate rinse container. Ignore all references to the rinse tubing and container in this procedure if you have the Low-volume unit.**

Prepare the containers and connect the tubing as follows:

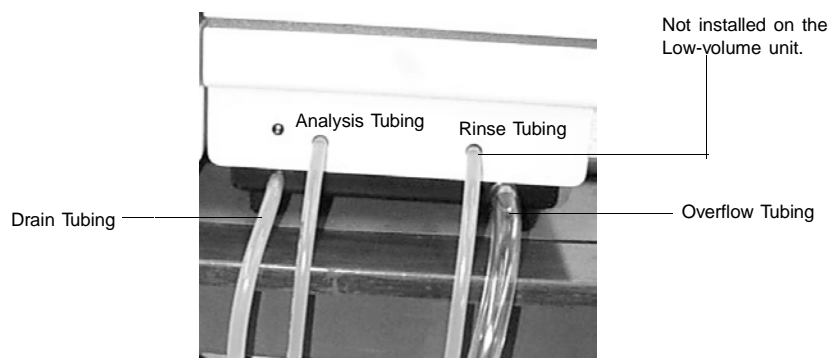
1. Prepare the containers:
  - a. Place the rinse and analysis liquid containers on the floor in front of the liquid sample handler; remove the caps.
  - b. Pour approximately 10 liters of water into the rinse container. It may be necessary to add a small amount of surfactant for difficult-to-rinse materials. For example, you may wish to use 0.0005% sodium metaphosphate (W/W) in deionized water.



**If your rinse and analysis liquids are the same or if you are installing the Low-volume unit, skip step c. Be sure to access the Unit configuration dialog and specify that the rinse and analysis liquids are the same.**

- c. Pour approximately 10 liters of liquid containing a small amount of surfactant into the analysis liquid container.
    - d. Place the waste container on the floor beside the rinse and analysis containers. If you plan to use a MasterTech with the standard sample handler, replace the 5-gallon container with one that will hold at least 10 gallons. If available, a direct-drain system would be more desirable when using the MasterTech.
    - e. Label the containers appropriately.
  2. Remove the plugs from the tubing ports on the front panel of the liquid sample handler.

3. Install the tubing onto the ports of the liquid sample handler as shown below.
  - The two pieces of 0.64-cm (1/4-in.) diameter tubing are installed on the two upper ports (analysis and rinse).
  - The 0.79-cm (5/16-in.) diameter tubing (drain) is installed on the lower left port and the 1.27-cm (1/2-in.) diameter tubing (overflow) is installed on the lower right port.



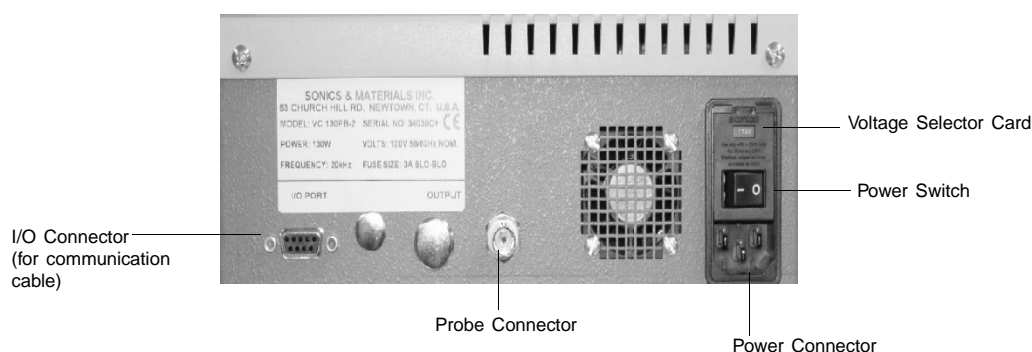
4. Insert the other ends of the drain tubing and the overflow tubing just inside the waste container. Use a clamp or similar device to ensure that the tubing is kept above the liquid level. Or, cut the tubing so that the ends are just inside the container. If the tubing is allowed to become immersed in liquid, timeout errors will occur.
5. Insert the other ends of the rinse and analysis tubing into the cap(s) of their respective containers, then install a weight onto the end of each tubing.
6. Place the cap(s) on the container and tighten; ensure that the tubing is resting on the bottom of the container(s).

Do not allow any of the tubing to form a loop so that flow is restricted; cut the tubing if required.

## Connecting the Ultrasonic Controller Unit

If your DigiSizer contains the optional ultrasonic probe, connect the ultrasonic controller unit to the probe as follows:

1. Place the ultrasonic controller unit on top of the liquid sample handler.
2. On the rear panel of the ultrasonic probe:



- a. Connect one end of the communication cable to the I/O connector.
- b. Insert one end of the ultrasonic probe cable into the probe connector.
- c. Insert appropriate fuse(s) for the input power source. Refer to the chart below for the appropriate fuse rating.



**The fuses used in the ultrasonic controller unit must be identical in type and rating to that specified. Use of other fuses could result in electrical shock and/or damage to the unit.**

<u>Power Source</u>	<u>Fuse</u>
100-120 VAC	3AG, 3.0 Amp Slow-Blow
200-240 VAC	5x20 mm, 1.6 Amp Slow-Blow (Type T)

- d. Ensure that the line voltage is set to match that of the input power source. Refer to the manufacturer's User's Guide shipped with the ultrasonic probe for instructions on setting the line voltage.

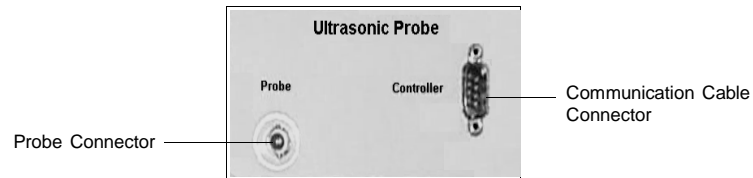


**Do not connect the ultrasonic power cord to a power source until the proper voltage selection is made. Doing so could result in electrical shock and/or damage to the ultrasonic unit.**

- e. Connect the power cord to the power connector and plug into an appropriate power source.



3. On the rear panel of the liquid sample handler in the area labeled **Ultrasonic Probe**:



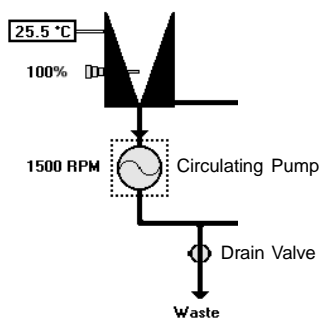
- a. Connect the other end of the communication cable (from the ultrasonic probe) to the connector labeled **Controller**.
  - b. Insert the other end of the ultrasonic probe cable into the connector labeled **Probe**.
4. Turn on the ultrasonic controller following the instructions provided in Chapter 3, *Turning On and Off the System*.

The operation of the ultrasonic probe is controlled through the analysis software.

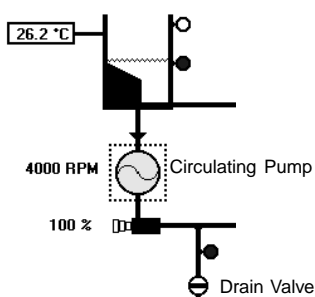
## Performing a Leak-Check Procedure

Rinse the system with water to ensure that all tubing and sample cell are installed properly.

1. Turn on the sample handler, then turn on the analyzer.
2. Select **Start, Programs, Micromeritics, Win5200** to initiate the Saturn DigiSizer software. Initialization may take a few minutes.
3. Open the front panel of the analyzer and remove the cover of the sample cell compartment.
4. Select **Rinse, DigiSizer** from the Unit menu.
5. Choose the **Rinses** option; specify 1, then click **Start**.
6. Observe all tubing connections, as well as the sample cell.
  - If leaks occur, click **Cancel** to stop the rinsing function. Close the front panel and select **Drain** on the Unit menu to drain the sample cell. Correct the problem, and repeat steps 3, 4, and 5.
  - If leaks do not occur, the DigiSizer is ready to perform analyses.
7. Replace the sample cell compartment cover and close the front panel.
8. Select **Show instrument schematic**, then **Enable manual control** from the Unit menu.
9. Right-click on the circulating pump; choose **Set speed**. Enter **1500** if you have the standard liquid sampler installed, or **4000** if you have the Low-volume liquid sampler installed.



Standard Sample Handler



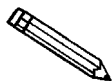
Low-volume Sample Handler

10. Right-click again and turn on the circulating pump while observing the sample cell.
  - If leaks occur, turn off the pump and open the drain valve immediately. Dry the sample cell area, correct the problem, and repeat the steps again.
  - If leaks do not occur after approximately 10-15 seconds, turn off the pump and open the drain valve to drain the liquid from the system.
11. Turn the pump back on for 3 to 5 seconds to expel any additional liquid that may have remained in the pump, then turn it off.
12. Close the drain valve.

## Verifying Operation

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Installation of the Saturn DigiSizer system is now complete. It is important to perform a checkout procedure to verify proper operation. This procedure is designed to assist you in verifying that all installation procedures were performed properly and that the Saturn DigiSizer and liquid sample handler are working properly. If two analyzers are installed, perform the procedure in its entirety on each one. This procedure should be performed following installation, and may be performed following any subsequent equipment repairs, replacements, or relocation.



**If a MasterTech is to be attached to the Saturn DigiSizer, verify operation of the Saturn DigiSizer first, then install the MasterTech as instructed in *Installing the MasterTech* later in this chapter.**

## Prepare the Analysis Liquid

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Water that has been freed of dissolved air (degassed water) is recommended for use as the analysis liquid. Water is easily and most efficiently degassed by using the AquaPrep 055 degasser (refer to Chapter 10 for ordering information).

If an AquaPrep is unavailable, water can be degassed by:

- heating to 80 °C for two hours and allowed to cool down, or
- evacuating while stirring for approximately two hours.



**If your DigiSizer is equipped with the standard sample handler and your rinse liquid is different from the analysis liquid, you do not have to use degassed water as the *rinse* liquid. Deionized water can be used for rinsing.**

## Rinse the Sample Cell

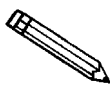
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1. Select **Rinse, DigiSizer** from the **Unit [n]** menu; the DigiSizer Rinse dialog is displayed.
2. Select **Rinses** and enter 3; this should be sufficient since the cell contains no sample material.
3. Click ; a dialog indicating that rinsing is in progress is displayed. When rinsing is complete, the dialog closes automatically.

## Perform a Background Measurement

---

1. Select **Background** from the **Unit [n]** menu; the Background Measurement dialog is displayed.
2. Select **Water** from the Analysis liquid group box.
3. Click .
4. Set the flow rate to 6.
5. Select **Report after measurement** and choose **Screen** as the destination.
6. Click ; a progress dialog is displayed, then the background measurement is displayed.



**If this background is unsatisfactory, you can measure another one by clicking . Refer to Appendix J for guidelines on determining an appropriate background.**

7. Click ; a report is generated to the screen. You can print a copy to a printer from the report window if desired.

## Create a Sample File

---

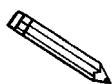
1. Select **Open, Sample information** from the File menu; the Open Sample Information dialog is displayed.
2. Click , then  to create a new file.
3. In the **Sample** field: place your mouse pointer at the end of the sample number, press , and enter **Garnet**.
4. Click on the down arrow to the right of the **Analysis Conditions** field and choose a file.

If...	Choose...
you have the ultrasonic probe installed:	<b>Garnet internal dispersion.</b> If you are using the Low-volume sampler handler, be sure to choose the one designated for Low volume.
you do not have the ultrasonic probe installed:	<b>Garnet external dispersion.</b> If you are using the Low-volume sampler handler, be sure to choose the one designated for Low volume.

5. Click on the down arrow to the right of the **Report Options** field and select **Garnet reference material**.
6. Click on the down arrow to the right of the **Sample** field and select **Garnet**.
7. Click on the down arrow to the right of the **Liquid** field and select **Water**.
8. Click  , then  .

## Prepare the Sample

---



**If you have the ultrasonic probe installed, skip this procedure and advance to *Begin the Analysis*.**

1. Weigh 0.04 gram of garnet in a sample cup.
2. Using an ultrasonic probe, disperse the mixture as follows:
  - a. Pour 25 mL of 0.01% sodium metaphosphate (W/W) in water into a beaker.
  - b. Use a spatula to transfer the garnet to the beaker of sodium metaphosphate.
  - c. Insert the probe and, while stirring, operate for approximately one minute at 40 watts.
3. Follow the instructions outlined in the reference material data booklet.

## Begin the Analysis

---

1. Select **Sample Analysis** from the **Unit [n]** menu; the Sample Analysis dialog is displayed with the Open Sample Information dialog positioned on top.
2. Navigate to the sample file you just created. Select the file, then  ; the Sample Analysis dialog is displayed again.
3. Click **Report after analysis** and choose **Printer** as the destination.
4. Click  ; a second view of the Sample Analysis dialog is displayed.
5. Slowly add sample to the reservoir; add enough to provide a beam obscuration of 13 to 15%. If the beam obscuration exceeds 15%, the DigiSizer will adjust the concentration automatically.

6. When the beam obscuration is in the appropriate range, click  to begin analysis and data collection.
7. When the analysis has finished and reports are printed, remove the reports from the printer; compare the results with those provided with the reference material.

This completes the procedure for verifying operation of the Saturn DigiSizer. If the results obtained match the referenced information within the specified limits, verification of proper system operation is complete.

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## Installing the MasterTech 052

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The MasterTech 052 Autosampler allows you to queue up to 18 samples and transfer them to the Saturn DigiSizer analyzer automatically for analysis. After installation, its operation should be verified to make sure that it is operating properly before actual analyses are attempted.

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### Removing Packing Material from the Unit

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Carefully remove the MasterTech and its components from the shipping carton. Remove all packing material and verify that all items listed on the packing list are included. Follow the procedures outlined in **Unpacking and Inspecting the Equipment** at the beginning of this chapter if any items are missing.

Place the MasterTech on a tabletop and proceed with the following instructions.

---

### Selecting the Voltage

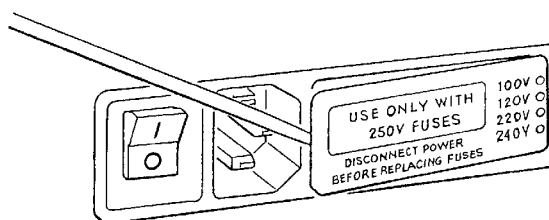
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The MasterTech leaves the factory set for 120 VAC and with the line fuse removed. The correct setting of the universal power entrance must be checked and the appropriate fuse installed before the MasterTech can be operated. The MasterTech is designed 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.



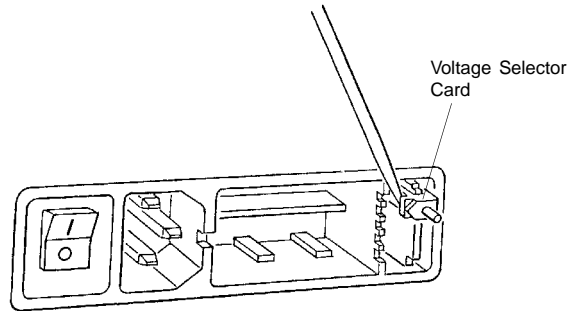
**The power cord should be disconnected from the MasterTech before removing the cover from the power input connector. Failure to disconnect the power cord could result in electrical shock.**

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.

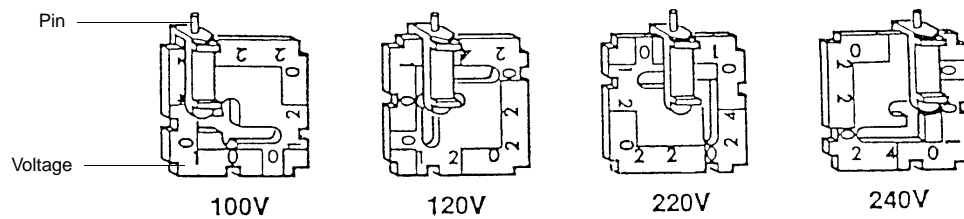




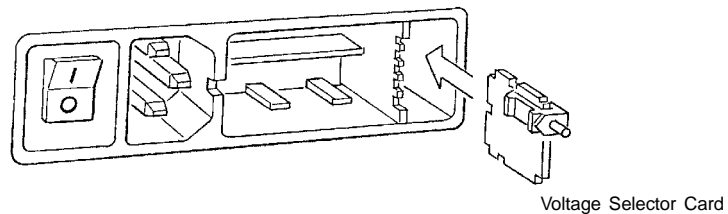
3. Pull the voltage selector card straight out of the power connector housing.



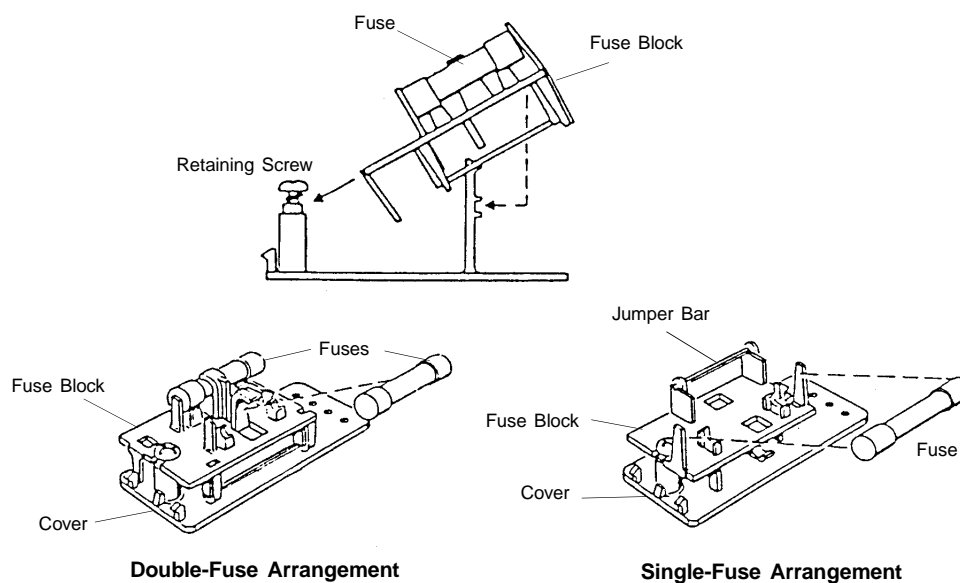
4. Orient the voltage selector card so that the desired voltage is indicated at the bottom. Orient the indicator pin so that it points upward as shown in the following illustration.



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.

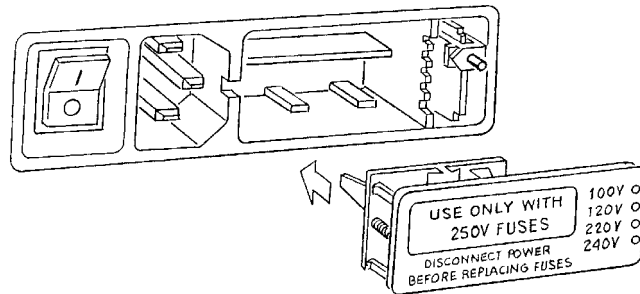


**The fuses used in the the MasterTech must be identical in type and rating to that specified. Use of other fuses could result in electrical shock and/or damage to the MasterTech.**

- c. Insert appropriate fuse(s) for the input power source. Refer to the chart below for the appropriate fuse rating.

<u>Power Source</u>	<u>Fuse</u>
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.



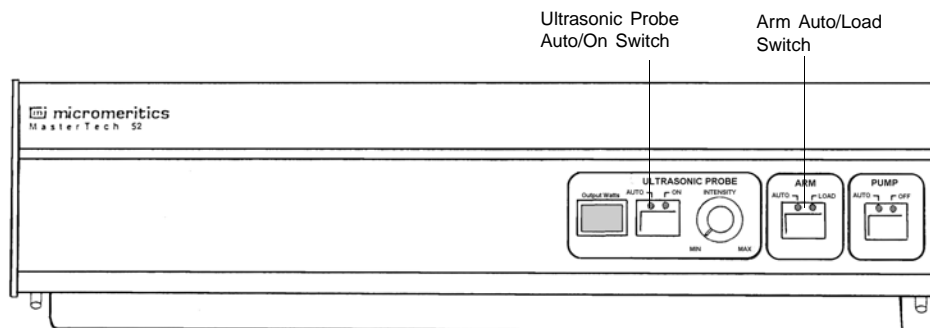
## Turning on the MasterTech

1. Make sure the proper operating voltage and fuse are selected and in place.
2. Plug the power cord into an appropriate power outlet.
3. Place the POWER ON/OFF switch 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. If the ON indicator is illuminated, press the switch to turn off the probe; the AUTO indicator should illuminate.**

4. 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.

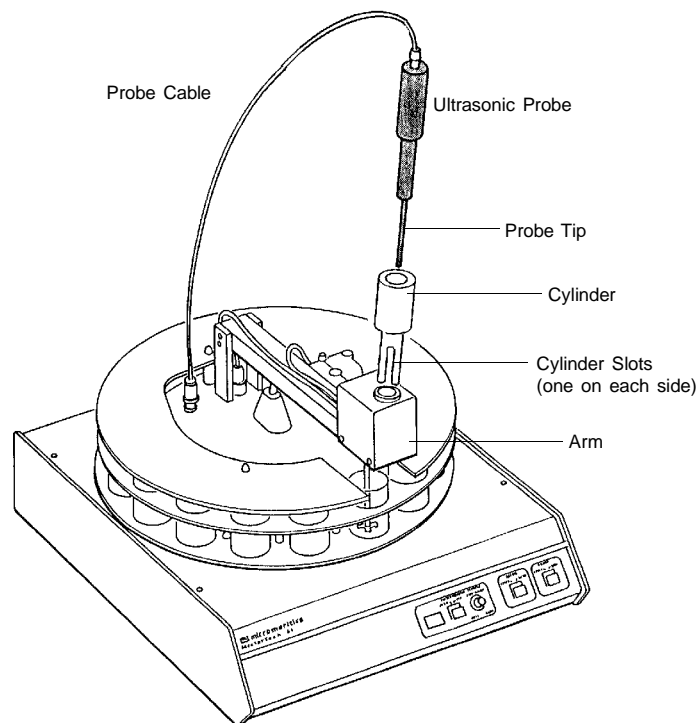


## Installing the Ultrasonic Probe

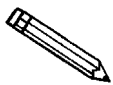


**Make sure that power is not being supplied to the unit before starting this procedure.**

1. Place the POWER switch on the rear panel of the MasterTech 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 before proceeding. A 1/4-in. probe tip is supplied with the MasterTech; 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.

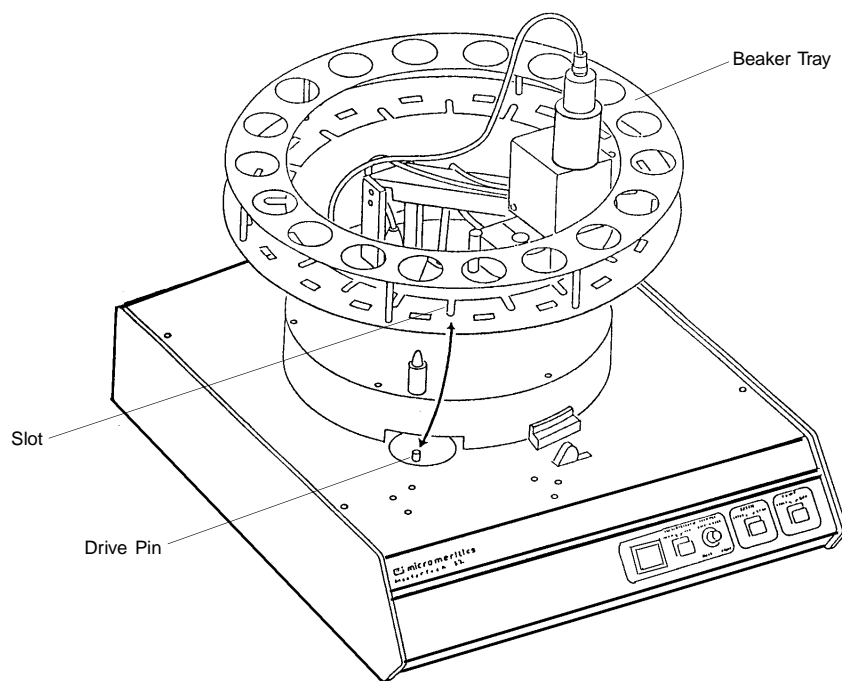


**Position the shorter slots of the cylinder over the protrusions if you are using the 1/8-in. probe.**

5. Insert the probe into the cylinder.

## Installing the Beaker Tray

1. Place the POWER switch in the ON position.
2. Make sure the arm of the MasterTech is in the LOAD (uppermost) position; the LOAD LED will be illuminated. If the LED is not illuminated, press the ARM AUTO/LOAD switch.
3. 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.
4. 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.

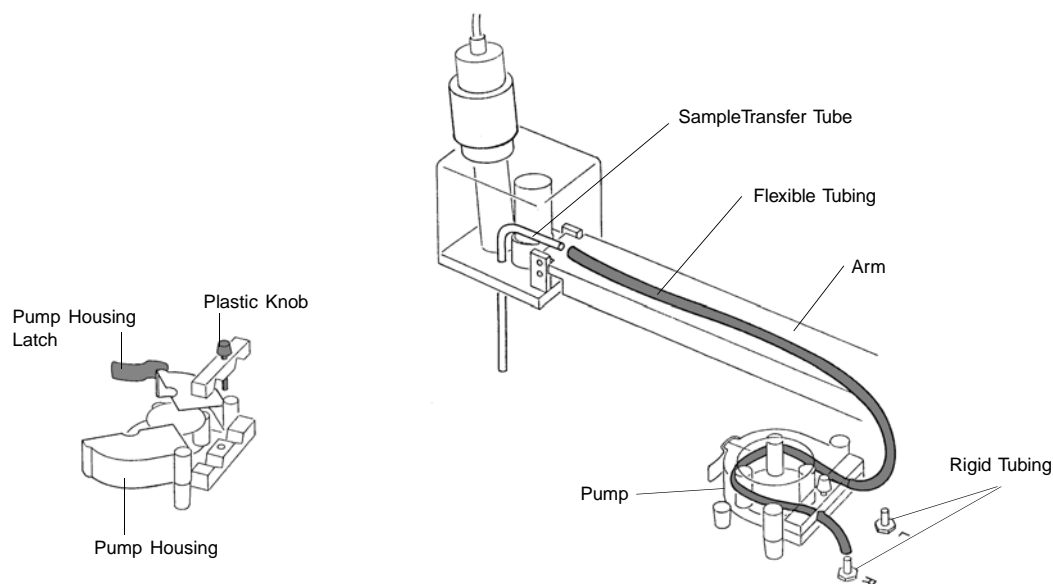


## Installing Sample Transfer Tubing

The MasterTech accessories kit contains two pieces of flexible tubing. One piece of tubing is for installation inside the MasterTech arm. The other piece of tubing is installed inside the liquid sample handler, allowing for connection to the MasterTech.

### MasterTech Installation

1. Ensure that the MasterTech POWER switch is in the ON position.
2. Make sure 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.
3. Press the end of one segment of flexible tubing over the sample transfer tube until there is at least 1/2-in. overlap.



4. Unlatch the pump housing and unscrew the plastic knob on the rear of the pump.
5. 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.

6. 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.

### **Liquid Sample Handler Installation**

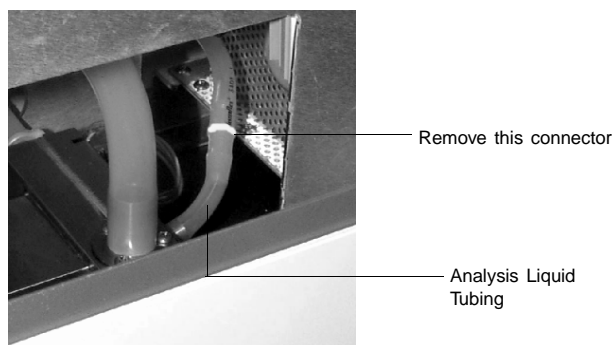
---

The following steps are common to both liquid sample handlers. After performing these steps, advance to the section of the liquid sample handler shipped with your DigiSizer to complete installation of the tubing.

1. If the liquid sample handler contains liquid:
  - a. Select **Drain, DigiSizer** from the Unit menu.
  - b. Turn off the liquid sampler and the analyzer.
2. Remove the retaining screws on the right side of the liquid sample handler, then loosen the captive thumb screw on the rear panel.
3. Lift off the cover and set aside.

### **Standard Liquid Sample Handler**

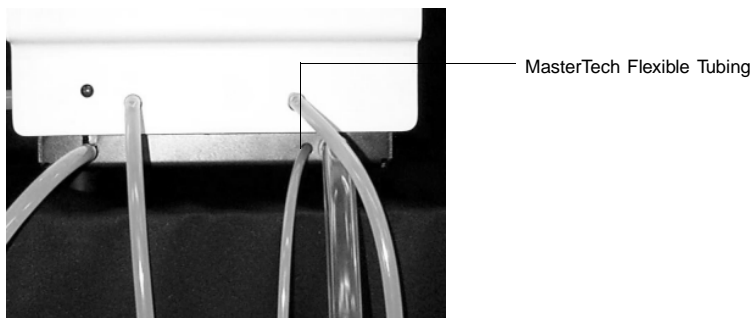
1. Locate the analysis liquid inlet tubing on the inside of the liquid sample handler.



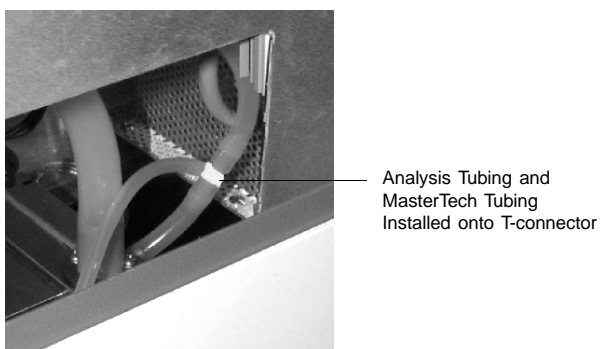
2. The analysis tubing has a connector approximately two inches from the inlet fitting; remove this connector.
3. Using the T-connector supplied in the MasterTech accessories kit, reconnect the tubing using the two larger ends of the T-connector.



4. Insert the remaining piece of flexible tubing through the hole provided on the base of the sample handler.



5. Guide the tubing through the hole in the front chassis (just below the rinse pump) and connect it to the remaining barbed fitting of the T-connector.



6. Install the other end of the flexible tubing onto the discharge tube on the side chosen in Step 5 of the MasterTech Installation.

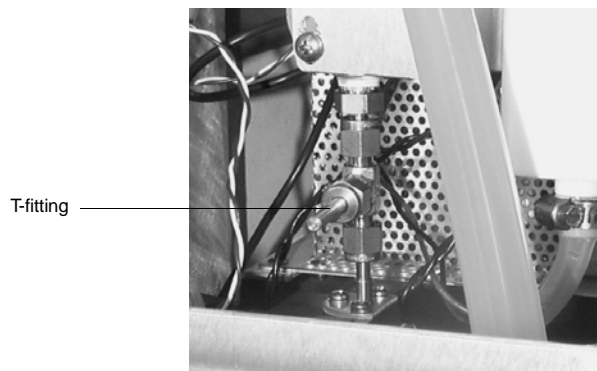


**Make sure the side to which you connect the flexible tubing coincides with the one chosen in the arm of the MasterTech.**

7. Replace the cover of the liquid sample handler. Replace the retaining screws on the right side of the unit and retighten the thumb screw on the rear panel.

### **Low-Volume Liquid Sample Handler**

1. Locate the T-fitting of the stainless steel tubing of the drain manifold.



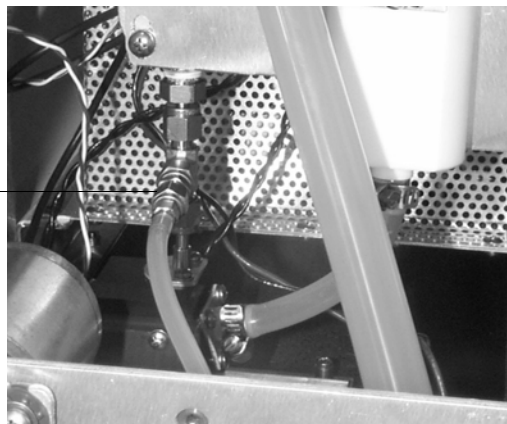
2. Use the 7/16- and the 1/2-in. wrenches provided in the accessories kit for this step. Hold the T-fitting secure with the 7/16-in. wrench, then use the 1/2-in. wrench to loosen and remove the topmost nut.



3. Remove the stainless steel plug from the nut. Be sure to store the plug in a secure location. If the MasterTech is disconnected, this plug will need to be reinstalled in the liquid sample handler.
4. Insert the stainless steel connector into the nut (the barbed end should be on the outside).
5. Reattach the nut to the T-fitting; tighten finger-tight. Then, using the two wrenches as shown above, tighten the nut 1/4 turn.
6. Insert one end of the flexible tubing (provided in the accessories kit) through the hole provided on the base of the sample handler.

7. Guide the tubing through the hole in the front chassis and connect it to the barbed fitting of the T-connector.

Tubing connected  
to fitting.



8. Install the other end of the flexible tubing onto the discharge tube on the side chosen in Step 5 of the MasterTech Installation.



**Make sure the side to which you connect the flexible tubing coincides with the one chosen in the arm of the MasterTech.**

9. Replace the cover of the liquid sample handler. Replace the retaining screws on the right side of the unit and retighten the thumb screw on the rear panel.

## Connecting Cables

---

1. Place the MasterTech to the right of the liquid sample handler.
2. Make sure the power switches on the rear panels of the analyzer and MasterTech are in the OFF positions.
3. Insert one end of the serial cable into the connector labeled **MasterTech RS-232** on the rear panel of the analyzer.
4. Insert the other end of the cable into the connector labeled **RS232** on the back of the MasterTech.

## Verifying Operation

---

To verify operation, manually move each subsystem using the manual control option of the Saturn DigiSizer analysis program.

1. Turn on the Saturn DigiSizer system and its components as follows:
  - Ultrasonic probe (if installed)
  - MasterTech autosampler
  - Liquid sample handler
  - Saturn DigiSizer
2. Select **Start, Programs, Micromeritics, Win5200** to initiate the Saturn DigiSizer software. Initialization may take a few minutes.
3. Fill a beaker with approximately 80 mL of water.
4. Place the beaker in the number **1** position of the tray.
5. 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.**

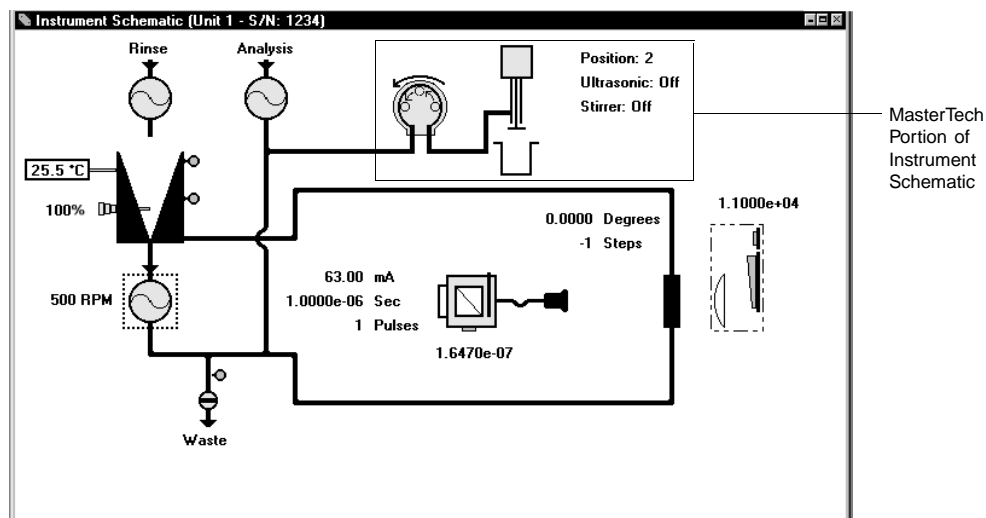
6. While holding the probe tip underwater, press the ultrasonic probe AUTO/ON switch. You will hear a high-pitched sound, indicating that the probe is working properly.



**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.**

7. Press the ultrasonic probe AUTO/ON switch again to turn off the probe.
8. Place the probe back into the holder.

9. From the **Unit [n]** menu, select **Enable manual control**. If the instrument schematic is not displayed, select **Show instrument schematic**.



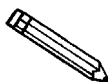
*This schematic shows the standard reservoir. If you have the Low-volume unit, the left side of your schematic will display differently.*

10. Ensure that the Arm AUTO/LOAD switch on the front panel of the MasterTech is in the AUTO position.
11. From the **Unit [n]** menu, select **Initialize MasterTech**.

A message is displayed indicating that initialization is in progress. The tray on the MasterTech rotates in a counterclockwise direction for one beaker position; 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 4 should now be directly under the arm of the MasterTech. Make sure the beaker contains approximately 80 mL of water.

12. On the instrument schematic, select the symbol representing the MasterTech arm.

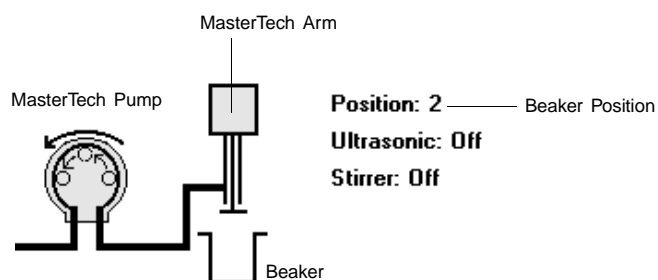


**When manual mode is enabled, components on the instrument schematic have pop-up menus displaying the options available for that component. Select the component, then click the right mouse button to access its pop-up menu.**

In each instruction for this step, first access the pop-up menu:

- a. Select **Move Arm Down** two times.

- b. Select **Ultrasonic On**; you will hear a high-pitched sound, indicating that the probe is operational.
- c. Select **Ultrasonic Off** to turn off the probe.
- d. Select **Stirrer On**; the stirrer begins to operate.
- e. Select **Stirrer Speed Fast**.
- f. Select **Move Arm Up**.
- g. Select **Stirrer Off**.
- h. Select **Move Arm Up**.
- i. Select **Move To Beaker** and enter the beaker position; note that the display is updated to reflect the position of the beaker tray. The picture on the screen will reflect whether or not a beaker is present.



13. Place the MasterTech pump switch on the front panel in the AUTO position, then select the MasterTech pump on the schematic. In each instruction in this step, first access the pop-up menu:
  - a. Select **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 Saturn DigiSizer system for analysis..

Select **Flow Direction Rinse**; allows suspension to move from the Saturn DigiSizer system to the MasterTech. This direction is used to rinse the sample from the stirrer and transfer tube on the MasterTech.
  - c. Select **Off** to turn the pump off.

14. Rinse and prime the tubing of the MasterTech:
  - a. Place an empty beaker in position **2** of the MasterTech tray.
  - b. Select **Rinse, MasterTech then DigiSizer** from the Unit menu.
  - c. Specify **2** as the beaker position, then click  .

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.

## **CHAPTER 3**

### **USER INTERFACE**

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- Controls, Indicators, and Connectors
- Turning On and Off the System
- Using the Software
- Menu Structure
- Windows Menu
- Help Menu





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## USER INTERFACE

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### Controls, Indicators, and Connectors

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This section contains a description of the controls, indicators, and connectors located on the front and rear panels of the Saturn DigiSizer, the liquid sample handler, and the MasterTech 052.

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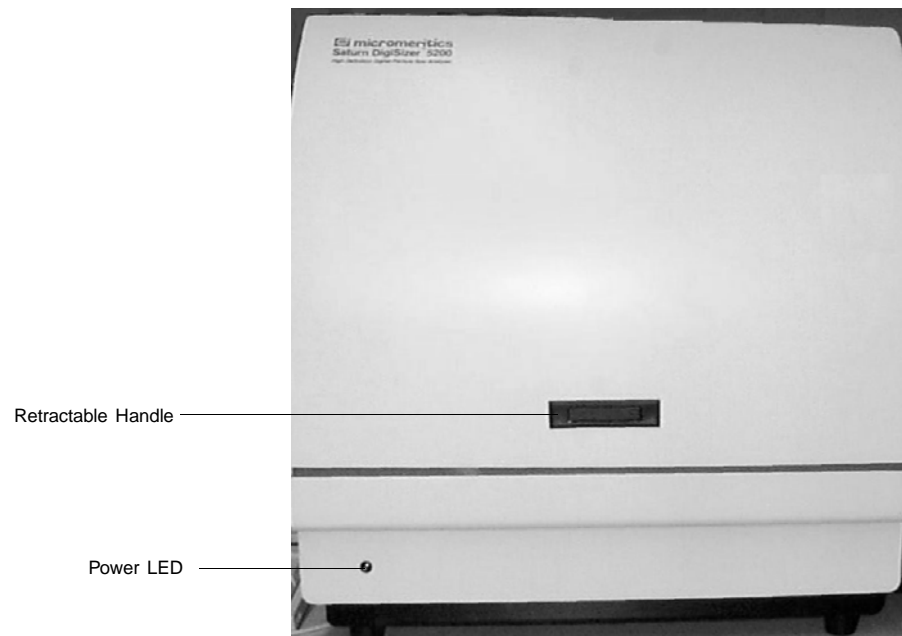
#### Saturn DigiSizer

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##### Front Panel

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##### **Power LED**

Illuminates when the analyzer has been turned on and the analysis program loaded. This LED will flash on and off until the program is completely loaded and ready for operation.

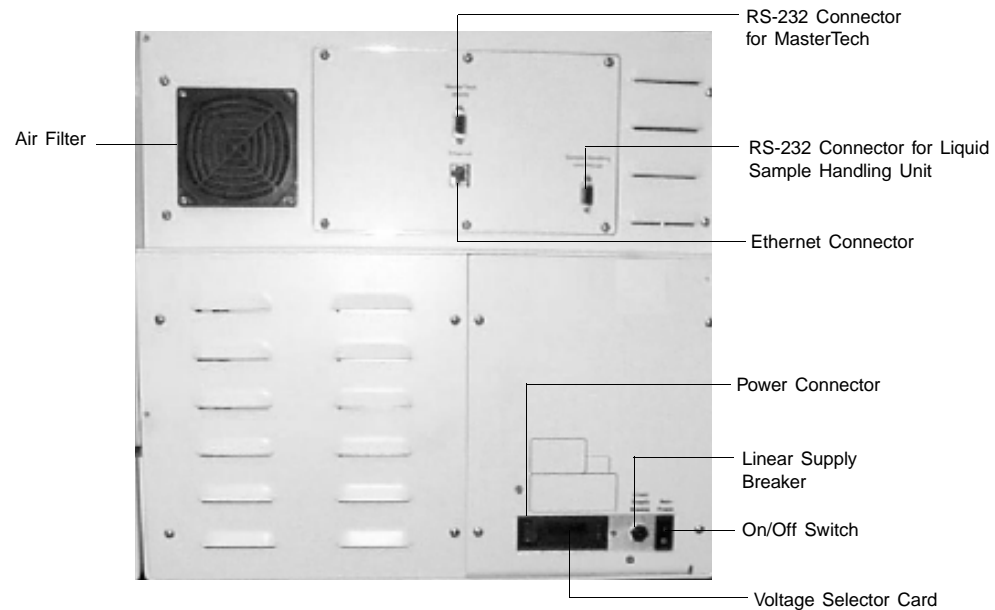
##### **Retractable handle**

When pressed on the right side, the handle extends outward so that you can open the front panel.

## Side Panel

The side panel of the analyzer contains two plumbing ports; an outlet (upper) and inlet (lower). These ports allow connection of the sample transfer tubing from the liquid sample handler to the sample cell holder.

## Rear Panel



<b>Air filter</b>	Minimizes the buildup of dust within the analyzer.
<b>Ethernet connector</b>	Allows communication between the computer and the DigiSizer analyzer.
<b>ON/OFF switch</b>	Turns electrical power on and off to the analyzer. The up ( I ) position turns on the analyzer and the down ( O ) position turns off the analyzer.
<b>Linear supply breaker</b>	This breaker serves to protect the linear supply that powers the detector. If the breaker trips after resetting, turn off the analyzer and contact your local Micromeritics service representative.
<b>Power connector</b>	Supplies electrical power to the analyzer.

<b>MasterTech RS-232</b>	Allows communication with a MasterTech 052 Autosampler.
<b>Liquid Sample Handling Unit RS-232</b>	Allows communication with the liquid sample handler.
<b>Voltage selector card</b>	Allows you to specify the proper operating voltage.

## Liquid Sample Handler

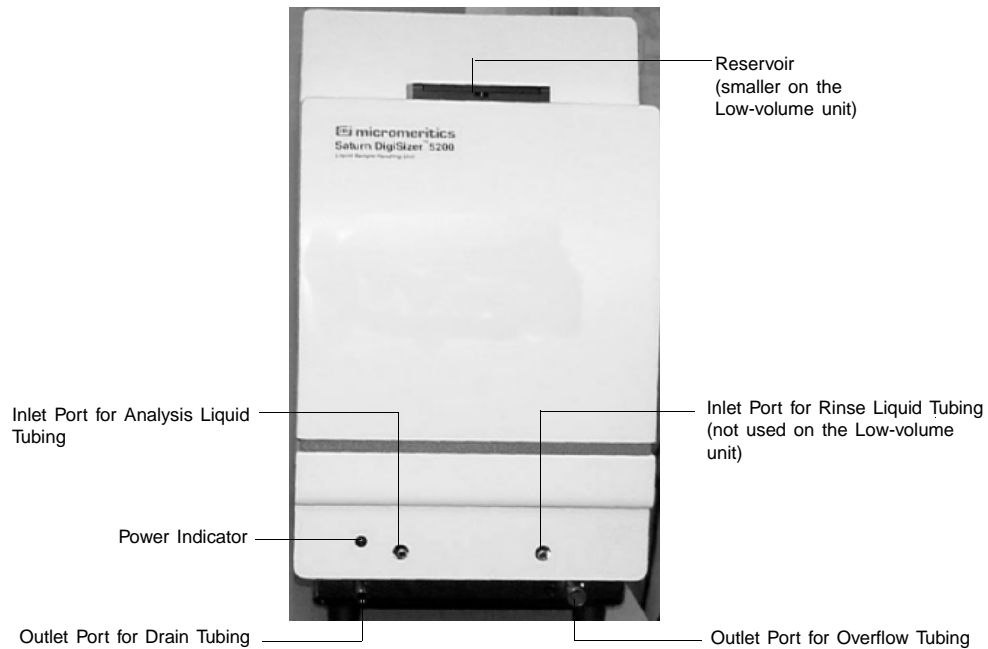
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The Liquid Sample Handler is available in two configurations: the Standard unit and the Low-volume unit. The Standard unit is shown for this illustration. The Low-volume unit is similar in appearance; the differences are:

- the size of the reservoir
- the inlet port for the rinse tubing is not used

### Front Panel

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#### Reservoir

The compartment into which the sample is placed for transfer to the DigiSizer analyzer for analysis.

#### Power indicator

Illuminated when liquid sample handler is turned on.

#### Ports

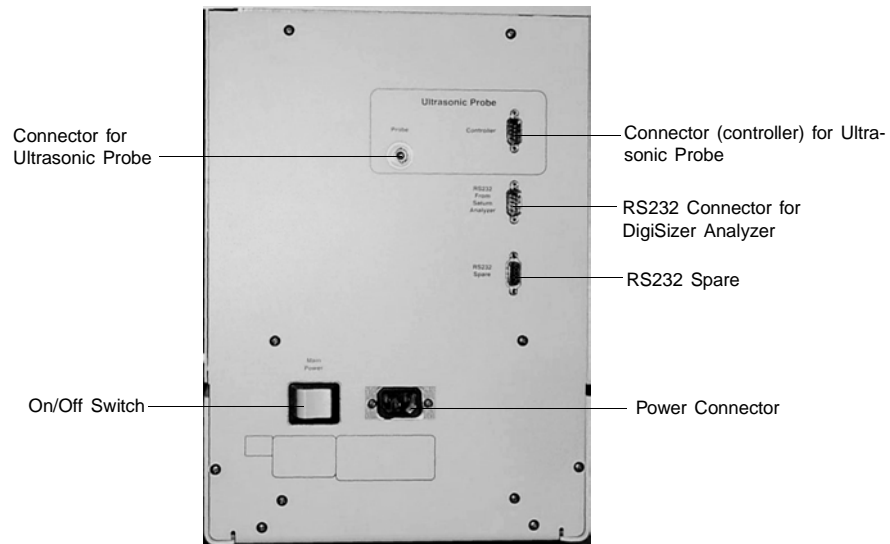
For tubing as indicated above.

### Side Panel

---

The side panel of the liquid sample handler contains two plumbing ports; an outlet (lower) and inlet (upper). These ports allow connection of the sample transfer tubing from the liquid sample handler to the analyzer.

## Rear Panel



### On/Off switch

Turns electrical power on and off to the liquid sample handler. The left ( I ) position turns on the unit and the right ( O ) position turns off the unit.

### Power connector

Supplies electrical power to the liquid sample handler.

### Controller

Allows communication between the ultrasonic probe and the liquid sample handler.

### Probe

Allows you to connect the ultrasonic probe.

### RS232 from analyzer

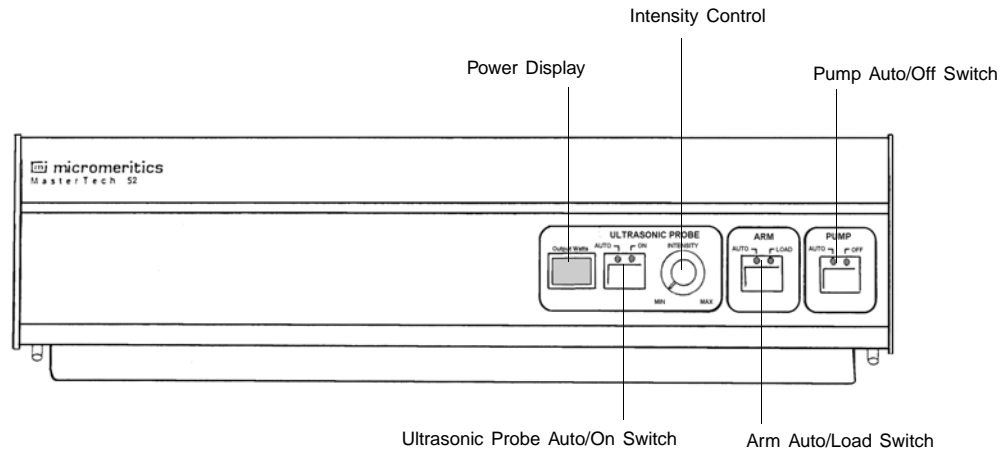
Allows communication between the liquid sample handler and the analyzer.

### RS232 spare

Spare connector.

## MasterTech 052

### Front Panel



### 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.

#### Power Display

Displays the power being generated by the ultrasonic probe.

#### INTENSITY control

Turn the control clockwise to increase the intensity of the probe, and 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 does not function unless the Saturn DigiSizer 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**

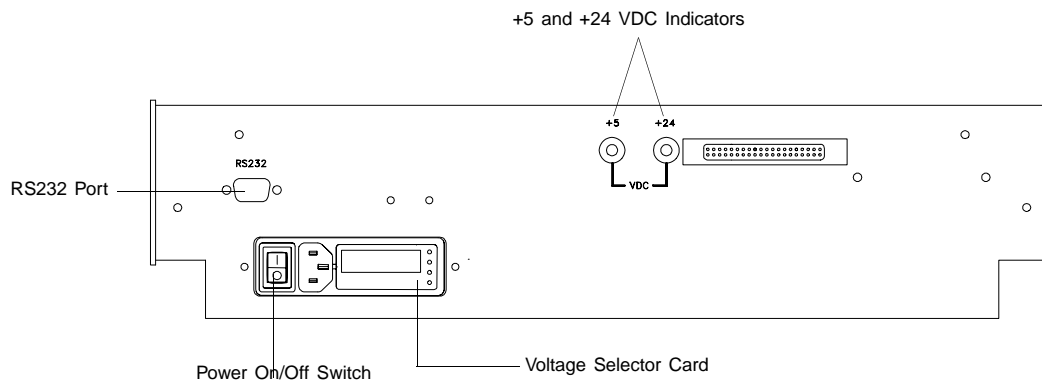
The LEDs on the switch indicate the mode of operation.

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 (I) position turns on the MasterTech.

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

Illuminate when appropriate power is present in the MasterTech.

### **RS232 port**

Allows connection of the communications cable.

### **Voltage selector card**

Allows you to specify the proper operating voltage.

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## Turning On and Off the System

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### Turning On the System

---

Components of the DigiSizer system must be turned on in a certain order so that all installed components are detected. Turn on the components in the following order:

1. Computer
2. Ultrasonic probe (if installed)
3. MasterTech 052 Autosampler (if installed)
4. Liquid sample handler
5. DigiSizer analyzer

After all components have been turned on: select **Start, Programs, Micromeritics, WIN5200** to start the analysis program.

### Turning Off the System

---

Turn off the system as follows:

1. Select **Close** from the System menu or **Exit** from the File menu.
  - If an analysis is in progress, the following message is displayed:

**2459- An analyzer is busy. A delay in restarting this application could result in loss of data. Continue with program exit?**

If you click  , the analysis *program* will close. However, the analysis and data collection continue and the reports queued in the Print Manager will print. If, however, a power failure occurs and an uninterruptible power supply (UPS) is not attached to the analyzer, the data collected *after exiting* the analysis program are lost.

- If data calculations are in progress, the following message is displayed:

**2458- An analyzer is performing a critical operation. Wait a few moments before exiting the application.**

You cannot exit the analysis program until calculations are complete.

2. Turn off components as follows:
  - DigiSizer
  - Liquid sample handler
  - MasterTech 052
  - Ultrasonic probe
  - Computer

## Preparing the System for Idle Periods

---

When the DigiSizer is not being used for analyses, it should be left with liquid in the reservoir so that the plumbing system remains primed. Perform the following steps to prepare the DigiSizer for idle periods of up to 7 days:

1. Fill the reservoir to the primed level with clean analysis (or rinse) liquid.
2. Select **Enable manual control** from the **Unit [n]** menu (select **Show instrument schematic** if it is not displayed).
3. Select the circulating pump; right-click and choose **Set speed**.
4. Enter 600; select  .
5. Exit the analysis program; DO NOT turn off the analyzer or liquid sample handler.

If the DigiSizer is to remain idle for a period of more than 7 days:

1. Select **Drain** from the **Unit [n]** menu to drain all liquid from the system. This also moves the rotation arm out of the way so that the sample cell is easily accessed.
2. Remove the sample cell (refer to **Cleaning the Optics, Sample Cell** in Chapter 9 for removal instructions).
3. Using a lens paper, dry the sample cell completely and place it inside its container. If the container is unavailable, wrap the cell with a lens paper and store it in a secure location.
4. Exit the analysis program and turn off all components as outlined in **Turning Off the System**.
5. Be sure to clean the sample cell before reinstalling. When turning components back on, refer to **Turning On the System** for the proper order.

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## Using the Software

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The DigiSizer 5200 analysis program operates in the Windows NT (Version 4.00 or newer) 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 online help (accessed by selecting **Start** on the taskbar) to clarify functions which are specific to Windows.

---

### Mouse

---

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). Alternatively, you can click once, then select  or press .

Use the mouse also to display pop-up menus for components contained on the instrument schematic while in manual mode and for editing reports. Select the desired item and click the *right* mouse button once to display the associated menu.

---

### Keyboard

---

Shortcut keys can be used to activate some menu commands. Shortcut-key combinations (if assigned) are listed to the right of the menu item. Instead of opening the menu and choosing the command, simply press the key combination. For example, to open a sample information file, press ; the Open Sample Information dialog is displayed. You can also use shortcut keys to access a menu or any function that contains an underlined letter by pressing  plus the underlined letter. For example, to access the **F**ile menu, press , then .

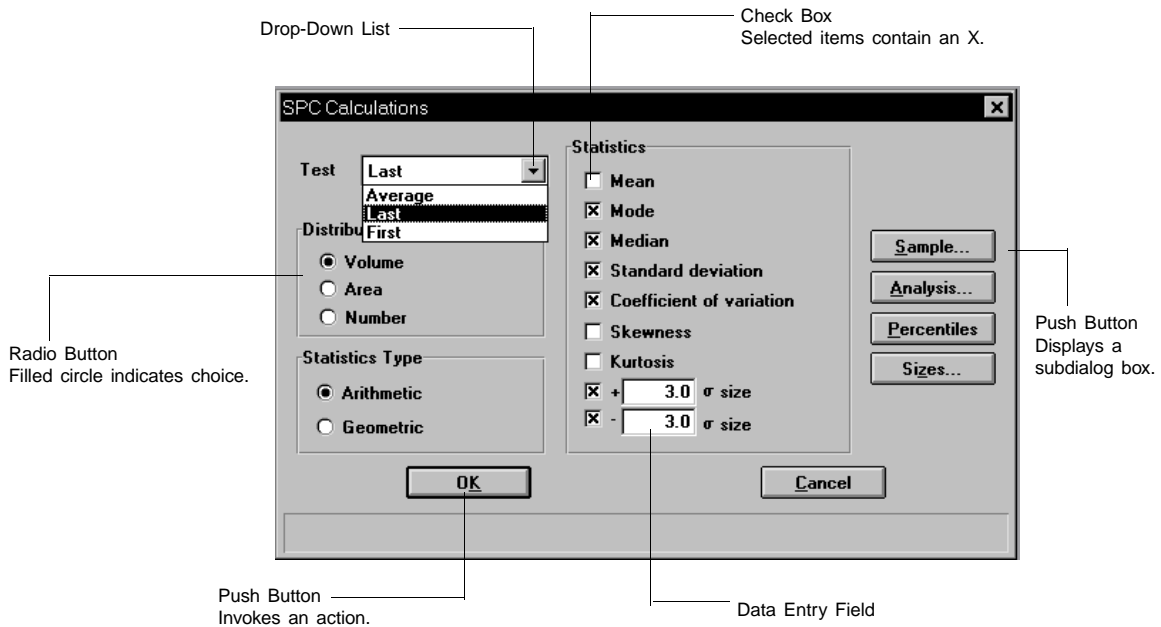
Table 3-1 lists the shortcut key(s) for operating the Saturn DigiSizer analysis program.

*Table 3-1. Shortcut Keys*

Select...	To...
<b>F1</b>	Access help information
<b>F2</b>	<ul style="list-style-type: none"> <li>• Open a sample information file (main menu bar)</li> <li>• Clear the field of existing date (Select Dates dialog)</li> </ul>
<b>F3</b>	<ul style="list-style-type: none"> <li>• Open an analysis conditions file (main menu bar)</li> <li>• Insert the current date (Select Dates dialog)</li> </ul>
<b>F4</b>	<ul style="list-style-type: none"> <li>• Open a material properties file (main menu bar)</li> <li>• Display a calendar from which to choose a date (Select Dates dialog)</li> </ul>
<b>F5</b>	Open a report options file
<b>F6</b>	Tile windows
<b>F7</b>	Cascade windows
<b>F8</b>	Start a report
<b>F9</b>	Closes all open report windows
<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 material properties files
<b>↑ Shift F5</b>	List report options files
<b>↑ Shift F9</b>	Display a pop-up menu of options available for selected component (on instrument schematic)

## Dialog Boxes and Subdialog Boxes

Dialog boxes are displayed when an item followed by an ellipsis (...) is selected. Subdialog boxes are displayed when certain push buttons are selected. Both types of boxes may contain one or more of the items listed below.



### Data entry field

A data entry field is used to enter text; either numeric (numbers only) or alphanumeric (numbers, letters, or printable characters).

### Push Button

A push button is used to display a subdialog box in which to enter additional information about the subject matter, or to invoke an action.

### Radio Button

Radio buttons are contained within a group box and are used to make choices. Only one radio button can be selected.

### Check Boxes

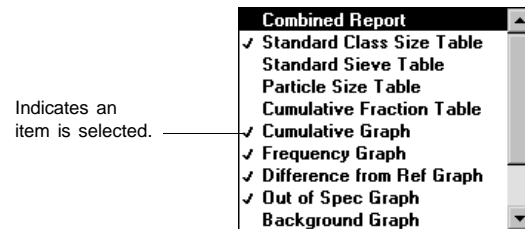
Check boxes are used to select options. You can select as many options as desired.

### Drop-down List

A drop-down list contains a list of options and is indicated by a down arrow to the right of the field. If there are more items than can fit in the box, a scroll bar is provided for navigating through the list.

## List box

A list box also displays options, but allows you to select as many as you wish. To select an item in a list box: move the mouse pointer to the desired selection and double-click. Alternatively, you may highlight the desired item and press **Spacebar**. An item is selected when it is preceded with a check mark (✓).



The following push buttons are common to the DigiSizer analysis program:

**Browse...**

Displays a dialog box allowing you to select a file for the subject matter.

**Cancel**

Closes the open dialog, discarding any information you may have entered and/or cancels the current operation.

**Next>>**

Advances you to the next screen. This push button is disabled if this is the last screen of a series.

**OK**

Closes the open dialog, saving any entries you may have made.

**<<Prev**

Returns to the previous screen. This push button is disabled if this is the first screen of a series.

**Replace...**

Allows you to copy file values from an existing file into the current one. This allows you to edit the values in the new file without changing the ones in the original file.

**Resume**

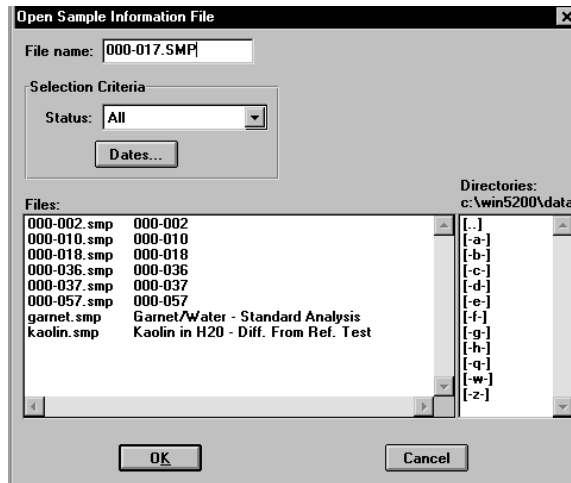
Resumes a suspended operation.

**Suspend**

Suspends the current operation. The push button changes to **Resume**.

## Selecting Files

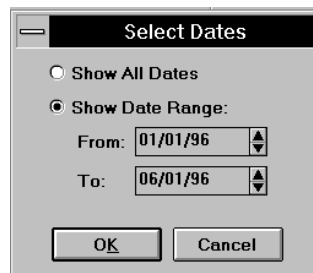
Sample information is stored in files and saved under file names. Certain dialog boxes contain a **Files:** list box which displays a list of files available for that particular operation. For example, the Open Sample Information dialog box:



A default string appears in the **File name** field. To select a file, simply move the mouse pointer to the desired file in the list 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 beginning with **garnet** as the first three characters by entering garnet\*.smp.
- Enter a range of dates. Select **Dates**; the Select Dates dialog is displayed.

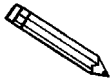


Select **Show Date Range** to enable the **From** and **To** fields and enter a beginning and ending date. Or, you can double-click in each field to display a calendar to select a date. The range of dates remains the default until you change the dates or select **Show All Dates**.



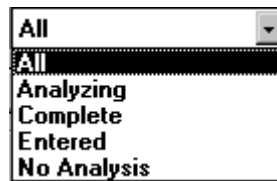
For convenience, the following shortcut keys are available when the Select Dates dialog is displayed:

- 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 Regional Settings function on the Windows Control Panel.**

- Select a file status from the Status drop-down list. Table 3-2 describes each file status.



*Table 3-2. File Status and Description*

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 in an analysis.
<b>Complete</b>	Sample information files that have had at least one test performed. Eight tests can be performed with each file.
<b>Entered</b>	Sample information files that contain manually entered data.
<b>No Analysis</b>	Sample information files that have not been used in 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 display. For Analysis Conditions, Report Options, and Material Properties files, only a default extension displays.

The following table shows the file name extensions for the Saturn DigiSizer analysis program.

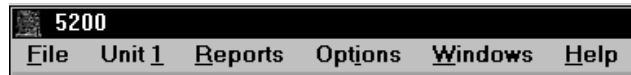
*Table 3-3. Default File Name Extensions*

File Type	Extension
Sample Information	SMP
Analysis Conditions	ANC
Material Properties	MTP
Report Options	RPO
Export to disk (ASCII)	EXP
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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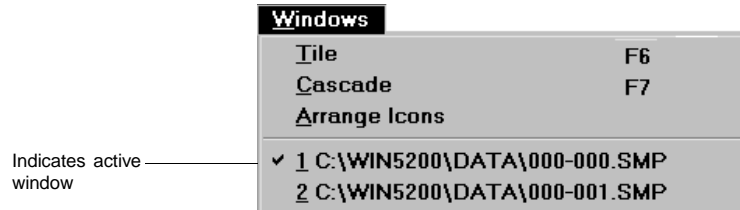
All functions for the Saturn DigiSizer are accessed from the main menu bar. Brief descriptions are provided below; refer to the chapter given in parentheses for a detailed description of the commands contained on that menu.

<b>File</b>	Allows you to manage sample and parameter files. (Chapter 5)
<b>Unit [n]</b>	Enables you to perform analyses and other instrument operations. (Chapter 6)  This menu item does not appear if the analysis program is being used for offline data manipulation.
<b>Reports</b>	Enables you to generate and close reports. (Chapter 7)
<b>Options</b>	Allows you to edit sample defaults, specify your system configuration, select data presentation formats, and manage models. (Chapter 8)
<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)
<b>Help</b>	Displays Help information. (this chapter)

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## Windows Menu

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- Tile** Resizes all open windows and arranges them side by side so that the contents of all open windows are visible.
- Cascade** Resizes all open windows and arranges them in a stacked fashion. The active window is positioned on top of the stack. Each window's title remains visible, making it easy to select other windows.
- Arrange icons** Arranges all minimized icons in an orderly manner.

The Windows menu also displays all open files; the active window is preceded with a check mark (✓).

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## Help Menu

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**Help**

Lists help topics for the Saturn DigiSizer analysis program.

**About DigiSizer**

Displays information about the Saturn DigiSizer analysis program.

## CHAPTER 4

# **OPERATIONAL PROCEDURES**

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- Specifying Sample Defaults
- Performing a Rinse Operation
- Performing Background Measurement
- Changing Analysis Liquids
- Preparing a Sample for Analysis
- Creating a Sample Information File
- Defining an Analysis Conditions File
- Defining a Material Properties File
- Defining a Report Options File
- Performing an Analysis
- Generating a List
- Exporting a Sample Information File
- Generating Reports
- Generating Overlays



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## OPERATIONAL PROCEDURES

---

This chapter describes brief, step-by-step instructions on how to:

- Specify sample defaults
- Measure a background
- Rinse the system
- Prepare sample and parameter files
- Perform an analysis
- Generate reports

This chapter does not contain detailed descriptions of the dialogs used to perform these procedures. Refer to Chapters 5 through 8 for dialog descriptions. Use the index to assist you in locating the appropriate dialog. Or, for the most convenient and quickest access to information, use online help.

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### Specifying Sample Defaults

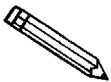
---

You can specify sample defaults in the Basic and/or the Advanced format. The defaults you specify are the ones you see when you create a new sample file in the respective format. Therefore it is best to specify (or enter) parameters that you plan to use the most. For example; specify defaults for your most commonly analyzed sample material. You can always edit parameters in the actual sample file.

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#### Basic Format

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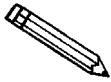
**For clarification on dialogs used in this procedure, access online help or refer to *Sample Defaults* in Chapter 8.**

Perform the following steps to define defaults for a Basic sample information file.

1. From the **Options** menu, select **Option presentation, Basic**.
2. From the **Options** menu, select **Sample defaults**; the Default Basic Sample Information dialog is displayed.



3. In the **Sequence** field, specify a default string for the sample file number, you can use up to eight characters. This is the number that appears in the **File name:** field when you select **File, Open, Sample information**.
4. In the right field of the **Sample:** line, enter a format for the sample's identification. Be sure to include the \$ symbol if you wish to have 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*.**

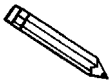
5. From the **Analysis Conditions** drop-down list, choose the analysis conditions file you wish to display as the default. Edit the default states for the **Autodilute**, **Number of tests**, and **Rinse** options if needed.
6. From the **Report Options** drop-down list, choose the report options file you wish to display as the default.
7. In the **Material Properties** group box, choose the sample and dispersing liquid you wish to use as the defaults.
8. In the reports list box, double-click on the reports to choose the ones you wish to use as the defaults.
9. Click **Save** , then **Close** .

## Advanced Format

Defining sample defaults in this format allows you to customize sample files. The values you specify in the parameter portions of the sample file (Analysis Conditions, Material Properties, and Report Options) also are saved as the defaults for newly created parameter files.

For example, after specifying defaults:

- Select **Open, Sample Information** from the File menu; **Yes** to create the file; and all defaults you specified display in all parameters.
- Select **Open, Analysis Conditions** from the File menu; **Yes** to create the file; and the defaults you specified in the Analysis Conditions portion of the Advanced Sample Defaults dialog display in the fields.

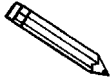


**For clarification of dialogs used in this procedure, access online help or refer to *Sample Defaults* in Chapter 8.**

1. From the **Options** menu, select **Option presentation, Advanced**.
2. From the **Options** menu, select **Sample defaults**; the DigiSizer Sample Defaults dialog is displayed.

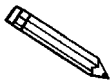
3. In the **Sequence Number:** field, specify a default string for the sample file number; you can use up to eight characters. This is the number that appears in the **File name:** field when you select **File, Open Sample information**.

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



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

5. Edit the **Operator:** and **Submitter:** lines as desired. Or have them omitted entirely by selecting **Omit**.
6. Specify user parameters (if desired). These fields provide additional sample characterization available for SPC (statistical process control) 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 field on the right. Or, if SPC reporting is not desired, you may have them omitted by selecting **Omit**.
7. Select the Analysis Conditions tab.

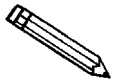


**You can also use  (located in the upper right-hand corner of the Sample Defaults dialog) to move to the next dialog.**

- a. Choose analysis conditions appropriate for your most commonly analyzed sample.
  - b. Click  .
8. Select the Material Properties tab.
    - a. Choose the sample material you most commonly analyze, a suitable dispersing liquid, and appropriate values.
    - b. Click  .
  9. Select the Report Options tab.
    - a. Choose desired report options.
    - b. Click  , then  .

## Performing a Rinse Operation

A rinse operation should be performed to rinse the analysis cell of any debris or contaminants from previous analyses. Since contaminants from previous analyses can affect results of subsequent analyses, it is best to perform a rinse operation after each analysis.



**For clarification of dialogs used in this procedure, access online help or refer to *Rinse* in Chapter 6.**

When you select **Rinse** from the **Unit [n]** menu, three choices are presented:

- **DigiSizer** - rinses the cell, the reservoir, and the tubing of the liquid sample handler and DigiSizer.
- **MasterTech** - rinses the MasterTech tubing into a specified beaker (enabled when a MasterTech is connected)
- **MasterTech then DigiSizer** - rinses the MasterTech first, then the liquid sample handler and DigiSizer as described above (enabled when a MasterTech is connected)

### DigiSizer

Perform the following steps to rinse the analysis cell, the reservoir, and the tubing of the DigiSizer.

1. From the **Unit [n]** menu, select **Rinse, DigiSizer**; the DigiSizer Rinse dialog is displayed.



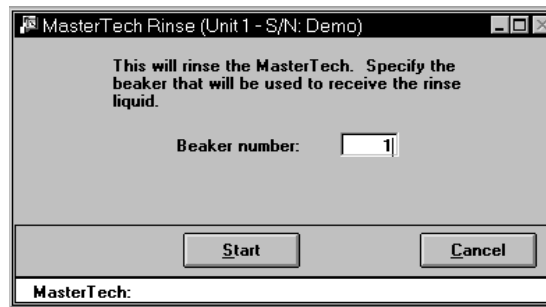
2. Choose *Autorinse* to have the analyzer automatically determine how many rinse cycles to perform based on beam obscuration, or *Rinses* to specify an exact number of rinses.
3. Click **Start**; progress messages are displayed until rinsing is complete, then the dialog closes automatically.

## MasterTech

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This option is enabled only if a MasterTech is connected to the analyzer. Perform the following steps to rinse the MasterTech tubing:

1. From the **Unit [n]** menu, select **Rinse, MasterTech**; the MasterTech Rinse dialog is displayed.

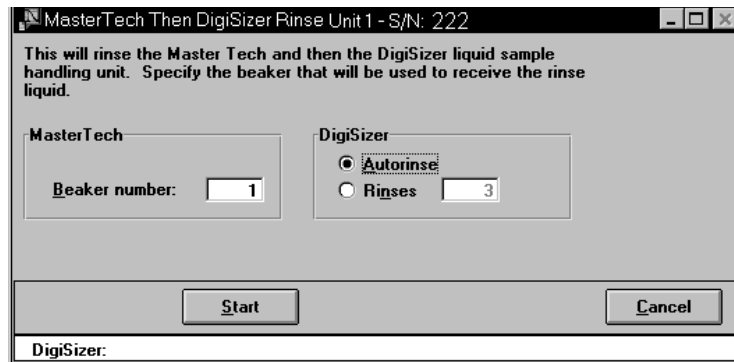


2. Enter the position number of the beaker that is to catch the rinse liquid. Be sure the beaker contains a small amount (approximately 10 mL) of liquid; otherwise, its presence may not be detected by the MasterTech.
3. Click **Start**; progress messages are displayed until rinsing is complete, then the dialog box closes automatically.

## MasterTech then DigiSizer

This option is enabled only if a MasterTech is connected to the DigiSizer. Perform the following steps to rinse the analysis cell, the reservoir, and the tubing of the DigiSizer and the MasterTech.

1. From the **Unit [n]** menu, select **Rinse, MasterTech then DigiSizer**; the MasterTech Then DigiSizer Rinse dialog is displayed.



2. In the MasterTech group box, enter the position number of the beaker that is to catch the rinse liquid. Be sure the beaker contains a small amount (approximately 10 mL) of liquid; otherwise, its presence may not be detected by the MasterTech.
3. In the DigiSizer group box, choose *Autorinse* to have the analyzer automatically determine how many rinse cycles to perform based on beam obscuration, or *Rinses* to specify an exact number of rinses.
4. Click **Start**; progress messages are displayed until rinsing is complete, then the dialog closes automatically.

## Performing a Background Measurement

A background measurement is required for data collection. It is not necessary to measure a background for each analysis. It is recommended that you perform a background measurement once per shift and when you change analysis liquids. You can measure up to eight backgrounds, but only the last one can be saved and used. Refer to Appendix J for a discussion and examples of acceptable and unacceptable backgrounds.

Perform the following steps to measure a background.

1. From the **Unit** menu, Select **Background**; the Background Measurement dialog is displayed.

This group box displays statistics for the current background.

Analysis Liquid	Refractive Index	Date	Time
Water	1.330	1/15/00	9:51:34AM

Analysis liquid:

- Water
- Isopropanol
- 1-Butanol
- Ethanol
- Methanol
- Glycerol
- Octane

Description: Water

Refractive Index: 1.330

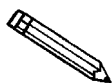
Viscosity: 0.890 cp

Density: 1.000 g/cm<sup>3</sup>

<< Prev    Next >>    Cancel

DigiSizer

2. Select the liquid you are using to measure the background (if different from the current one).



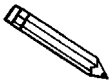
**If using a different liquid, be sure that you have inserted the analysis liquid inlet tube (extending from the front panel of the liquid sample handler) into the new liquid.**

3. Click **Next>>** ; another view of the Background Measurement dialog is displayed.
4. Ensure that the flow rate option is selected; enter 6.

5. Select *Report After Measurement* to have a background report generated automatically after the background is measured. Then select the drop-down list to choose a destination.

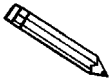
This background can be overlaid with backgrounds from other analyses for comparison if desired (refer to **Background** in Chapter 7).

6. Click ; a progress screen of the background being measured is displayed. The measurement is displayed in the final view of the Background Measurement window when it is finished. The current background is also displayed for comparison.



**The progress view of the background window provides a suspend and skip option if either action is desired.**

7. Click  to accept the measured background and close the window.



**If this background measurement is unsatisfactory, you can perform another one by selecting . If you choose to measure another background, the current one becomes inaccessible. You must use the last background measured. Refer to Appendix J for guidelines on determining acceptable backgrounds.**



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## Changing Analysis Liquids

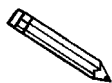
---

When changing analysis liquids, it is very important to remove all traces of the old liquid from the system and any air bubbles remaining in the liquid inlet pump.

If the new liquid is *immiscible* with the old liquid, this procedure must be performed twice:

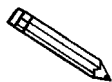
- the first time to change to a transition liquid which is miscible with the old *and* new liquid. Isopropanol (IPA) is often used as a transition liquid because it is miscible with water and many hydrocarbon-based liquids.
- and the second time to change from the transition liquid to the new liquid.

If a MasterTech is attached, its tubing must be drained and rinsed along with the rest of the system. Note that if a MasterTech is attached, it must always contain the same type of liquid used in the rest of the system, even if it is not used in analyses. This is necessary in order to prevent contamination or air bubbles.



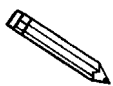
**For clarification of operations used in this procedure, access online help or refer to Chapter 6.**

1. Remove the analysis liquid inlet tube from the liquid supply. Drain the inlet tube, then wipe clean the outer surface; place it on a paper towel to absorb any further residue.
  - If your DigiSizer is equipped with the standard liquid sample handler, repeat this step for the rinse inlet tube.
2. Select **Drain** from the Unit menu to drain the system of liquid.
3. Select **Enable Manual Control** from the Unit menu to enable manual control.
4. Click the analysis pump icon. Turn on the pump and allow the pump to operate for approximately 10 seconds, then turn it off.



**A quick-and-easy method for turning pumps on and off is simply to press the spacebar after selecting the appropriate pump.**

5. Select **Drain** from the Unit menu to drain any liquid remaining in the system.
  - If your DigiSizer is equipped with the standard liquid sample handler, repeat steps 4 and 5 for the rinse pump.
6. If a MasterTech is attached:
  - a. Place an empty beaker in position **1** of the MasterTech tray.
  - b. Select **Load from MasterTech** on the Unit menu; ensure that beaker **1** is designated and that the stirrer and probe times are specified as 0.

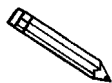


**If you receive an error message indicating that the beaker is not present, press down on the beaker to enable the sensing mechanism. Then repeat the Load operation (step 6-b).**

- c. Select **Drain** from the Unit menu to drain the system again.
7. Wipe any additional residue from the analysis liquid inlet tube and place it into the new liquid supply.

If the new liquid requires a new **Waste** container, replace the container.
8. Turn on the analysis pump; allow the inlet tube to fill until the liquid level reaches the fitting on the front panel of the liquid sample handler, then turn off the pump.
9. Repeatedly turn on and off the analysis pump at one-second intervals until the Full liquid level sensor is on (sensor turns blue).
10. Select **Drain** from the Unit menu to drain the system again.
11. For the standard sample handler, repeat steps 6 through 10 for the rinse inlet.
12. Select **Rinse, DigiSizer** from the Unit menu.
  - For the standard sample handler: perform three separate rinse operations of one rinse cycle each (this flushes both the analysis inlet and rinse inlet three times).
  - For the Low-volume sample handler: perform one rinse operation with 3 rinse cycles.

13. If a MasterTech is attached:
  - a. Place an empty beaker in position **1** of the MasterTech tray.
  - b. Select **Rinse, MasterTech** from the Unit menu
  - c. Empty the beaker, replace it onto the MasterTech tray, and repeat the rinse cycle.
  - d. Select **Rinse, DigiSizer** from the Unit menu; rinse the DigiSizer with one rinse cycle.
14. Select **Background** from the Unit menu, select the new liquid, then complete the measurement.



**If the background intensity is unusually high, remove and clean the cell (refer to *Cleaning the Optics* in Chapter 9); then repeat this step. Appendix J provides guidelines for determining a good background.**

15. Select **Rinse, DigiSizer** from the Unit menu; perform one rinse cycle.
16. Perform another Background analysis.

Examine the overlay of the current and previous background intensities. With the graph window maximized, most of the intensity data for the two curves should coincide so that only one color is showing. It is acceptable to have small differences (two colors showing with little or no white space between them) in small regions, and particularly in the data at greater than 10 degrees scattering angle. If the difference in the two background intensity curves is greater than 10 degrees, repeat steps 15 and 16 until a stable background intensity is achieved.

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## Preparing a Sample For Analysis

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A sample must be dispersed properly before it can be analyzed. Refer to **Appendix B, Sample Dispersion and Concentration** for a discussion on sample dispersion and concentration. After the dispersed sample has been loaded into the reservoir, particle dispersion can be maintained using an ultrasonic probe (optional).

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## Creating a Sample Information File

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Every analysis requires a sample information file. The file consists of information groups which, collectively, identify the sample (sample information), guide the analysis (analysis conditions, material properties), and specify the data reduction (report options).

A sample file may be created in three different formats:

- **Advanced.** This format provides complete access to all parts of the sample file, allowing you to quickly edit parameters as required.
- **Basic.** This format presents a single window in which you select predefined parameter files for your analysis.
- **Restricted.** This format is identical to the Basic format, except that certain menu options become disabled. In the Restricted mode, you cannot define defaults for SPC reports or sample files, nor can you switch to the Advanced format. This mode is also password-protected.

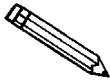
Select **Option presentation** from the **Options** menu to choose the format you wish to use.

## Basic and Restricted Formats

The Basic and Restricted formats are the easiest and most popular methods for creating a sample file because you create your file using predefined parameter 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 the Advanced format by selecting **Advanced**.

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

- You must enter a password to access this format (refer to **Option Presentation** in Chapter 8)
- Certain menu options become disabled
- You cannot switch to Advanced format



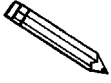
**For clarification of dialogs used in this procedure, access online help or refer to *Open* in Chapter 5.**

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

1. From the **File** menu, select **Open, Sample information**; the Open Sample Information File dialog is displayed.
2. Accept the next sequenced file number or enter a new name (up to eight characters) in the **File name** field.
3. Click **OK**, then **Yes** to create the file; the Basic Sample Information dialog is displayed.

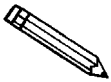
Use this push button to copy parameters from an existing file into the current one.

Not displayed when using the Restricted format.



Choose  to copy parameters from an existing file into this one. After copying the parameters, you may edit them as desired. The file from which they were copied will not be altered in any way.

4. Select the down arrow at the **Analysis Conditions** field and choose an Analysis Conditions file from the drop-down list.
5. Select **Autodilute** to have the Saturn automatically maintain dilution of the sample concentration.
6. Enter the number of tests you wish to perform using this file. You can perform up to eight tests with the same file.
7. It is best to leave the **Rinse** option selected at this time unless you plan to select it at the time of analysis.
8. Choose the sample material and the analysis liquid from their respective drop-down lists.
9. Select the down arrow at the **Report Options** field and choose a Report Options file from the drop-down list.
10. In the Report Options list box, select the reports you wish to have generated. (Reports are selected when preceded with a check mark.)

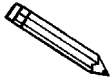


Select reports by double-clicking on the desired report; they are deselected in the same manner.

11. Click  , then  .

## Advanced Format

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



**For clarification of dialogs used in this procedure, access online help or refer to *Open* in Chapter 5.**

1. From the **File** menu, select **Open, Sample Information**; the Open Sample Information File dialog box is displayed.
2. Accept the next sequenced file number or enter a new name in the **File name** field.
3. Click **OK**, then **Yes** to create the file; the Advanced Sample Information dialog is displayed.

These fields are used for SPC reporting only. The labels (parameters on which to report) can be specified by selecting **Sample defaults** from the **Options** menu.

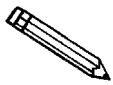
4. Enter the names of the operator and submitter.
5. Choose whether you wish to have data collected automatically or whether you plan to enter the data.
6. Unless you are gathering statistical process control information, it is unnecessary to enter parameter values. These are user-definable parameters that can be entered and tracked along with other statistical process control data.

The steps for completing the remaining parameters of the sample information file are explained in subsequent sections. Simply click on the next tab to open its associated dialog.

## Defining an Analysis Conditions File

Analysis conditions specify the data used to guide an analysis. Analysis conditions files can be created as an independent file and used as often as needed. After you load the analysis conditions file into the sample file, it becomes part of the sample file and can be edited as desired. The original analysis conditions file remains unchanged and available for its next use. 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 directory) are included with the Saturn DigiSizer analysis program. If you wish to have a newly created file display in the drop-down list on the Basic sample information dialog, be sure to save it to the directory specified as the Parameter file directory (refer to Chapter 8).



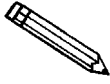
**For clarification of dialogs used in this procedure, access online help or refer to *Open* in Chapter 5 (use the index to assist you in locating the dialog).**

Perform the following steps to define an analysis conditions file.

1. From the **File** menu, select **Open, Analysis conditions**; the Open Analysis Conditions File dialog is displayed.
2. Enter a name (up to eight characters) in the **File name:** field, then click **OK**.
3. Click **Yes** to create the file; the Analysis Conditions dialog is displayed.



4. Enter a description in the **Analysis Conditions** field.



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

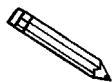
5. Specify flow rate requirements. You can have the flow rate calculated automatically by the DigiSizer or you can enter a value.
6. In the Redispersion group box:
  - a. Select **Ultrasonic probe** if you are using an ultrasonic probe, then enter the percent of intensity for operation and how long you wish to have the sample agitated before analysis. You can also choose to have the probe remain on during analysis.
  - b. Select **Circulate before data collection** if you wish to have the analysis liquid circulated through the system after adding the sample, then enter how long circulation is to occur.
  - c. Select **Redisperse before each test** to have the sample redispersed just before each analysis.
7. In the Obscuration group box:
  - a. Specify a range for beam obscuration, or accept the defaults.
  - b. Select **Autodilute** to have the Saturn DigiSizer automatically maintain dilution of the sample concentration.
8. In the Data Collection group box:
  - a. Enter the beam angle at which to stop data collection. This field defaults at 45, and is generally appropriate for most samples. The beam angle can be decreased if the sample does not contain small particles.
  - b. Enter the number of tests to be used with this file. Eight tests can be performed using the same file.

9. Select **Rinse after analysis** to rinse the system after all specified tests are complete. Then choose **Autorinse** (the system determines the rinses) or enter a specified number of rinses.
10. If you are using the MasterTech, click **MasterTech Treatment** and specify the stirring time, stirring speed, and probe time.
11. Click **Save**, then **Close**.

## Defining a Material Properties File

Material properties specify data for the sample material and its dispersant. Material properties files can be created as an independent file and used as often as needed. After you load the materials properties file into the sample file, it becomes part of the sample file and can be edited as desired. The original material properties file remains unchanged and available for its next use. This feature is especially useful if you have a certain type of sample material that you analyze on a regular basis.

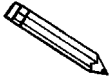
Several material properties files (located in the PARAMS directory) are included with the Saturn DigiSizer analysis program. If you wish to have a newly created file display in the drop-down list on the Basic sample information dialog, be sure to save it to the directory specified as the Parameter file directory (refer to Chapter 8).



**For clarification of dialogs used in this procedure, access online help or refer to *Open* in Chapter 5 (use the index to assist you in locating the dialog).**

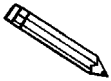
1. From the **File** menu, select **Open, Material properties**; the Open Material Properties dialog box is displayed.
2. Enter a name (up to eight characters) in the **File name:** field, then click .
3. Click  to create the file; the Material Properties dialog is displayed.

4. Enter a description in the **Material Properties** field.



Use an intuitive name that will help you identify the type of sample you plan to analyze using this file. You may want to use a name containing the type of sample material and dispersing liquid. For example, Garnet/Water.

5. Choose the sample material from the **Sample Material** list box. If your material is not listed, add it to the list:
  - a. Enter the sample material in the **Description** field.
  - b. Enter the real and imaginary portions of the material's refractive index.
  - c. Enter the material's density.
  - d. Click  .
6. Choose a dispersing liquid from the **Analysis Liquid** list box. If your dispersing liquid is not listed, add it to the list:
  - a. Enter the dispersing liquid in the **Description** field.
  - b. Enter the refractive index for the liquid
  - c. Enter the viscosity and density for the liquid.



Refer to Appendix D for a list of common dispersing liquids and their density and viscosity values.

- d. Click  .
7. The refractive indices for the sample material (in parentheses) and the dispersing liquid are displayed on the top line of the **Scattering Model** group box. The model chosen by the system is displayed on the second line. Click  to choose a different model or to generate a model for the exact refractive indices selected.
8. Click  , then  .

---

## Defining a Report Options File

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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 after the analysis.

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

Report options files also may be defined to include overlay options. The Saturn software enables you to overlay up to eight plots of different samples onto the current plot of the same type. Or you can overlay one plot type onto a different plot type from the same sample analysis. For example, a cumulative mass plot may be overlaid with a mass frequency plot.

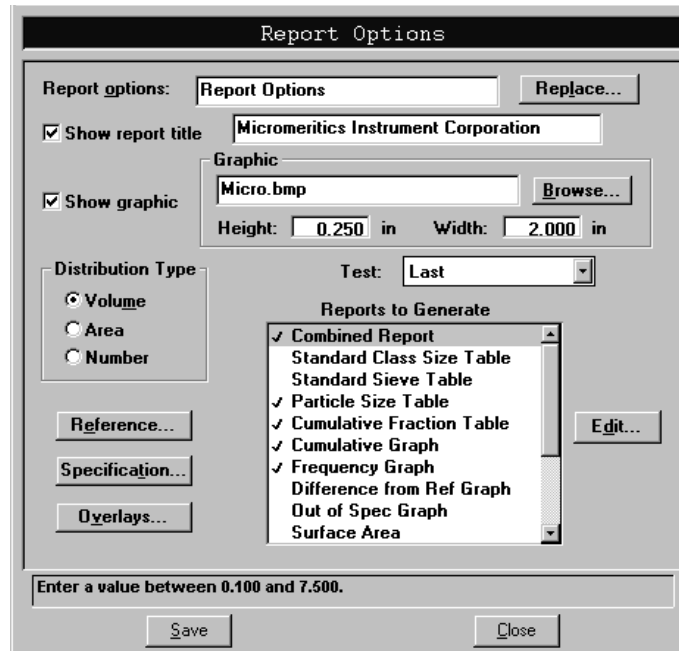
Several report options files (located in the PARAMS subdirectory) are included with the analysis program. If you wish to have a newly created file display in the drop-down list on the Basic sample information dialog, be sure to save it to the directory specified as the Parameter file directory (refer to Chapter 8).



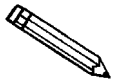
**For clarification of dialogs used in this procedure, access online help or refer to *Open* in Chapter 5 (use the index to assist you in locating the dialog).**

Perform the following steps to define a report options file.

1. From the main menu, select **File, Open, Report options**; the Open Report Options dialog box is displayed.
2. Enter a name (up to eight characters) in the **File name:** field, then click  .
3. Click  to create the file; 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 file's contents. For example, *Tabular Report using Volume Distribution*.
5. Select **Show report title** and enter the title you wish to appear at the top of the report. Or deselect this option if you do not wish to have a report title.



**If your company logo exists as a bitmap (bmp) or an enhanced metafile (emf) file and you wish to have it display in the report header, select *Show graphic*. Then click **Browse...** to select the file.**

6. Choose whether you wish the data distribution to be reported as *Volume*, *Area*, or *Number*.
7. 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** report.
8. 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** report.
9. If you wish to overlay graphs, click **Overlays...** and choose the sample file(s) you wish to overlay with a graph of the current sample. Then be sure you edit the graph and choose **Samples** in the **Overlay** field.
10. 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 tests will be generated.

11. From the **Reports to Generate** list box, choose the reports you wish to have generated. A report is selected when it is preceded with a check mark. To select (or deselect) a report: highlight the report, then double-click or press  .
12. Edit any reports you wish by highlighting the report, then clicking  .
13. Click  , then  .

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## Performing an Analysis

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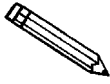
There are four different ways in which an analysis (or analyses) may be performed:

- **Sample Analysis:** Used to perform up to eight analyses on a *single* sample.
- **QuickStart Analysis:** Used to perform *a series of samples of the same type* with the same analysis conditions; sample files are generated automatically.
- **MasterTech Automatic:** Used to analyze a *series of samples of the same type* with the same analysis conditions. Sample files are created automatically; samples are transferred from the MasterTech automatically. Functional only if a MasterTech is installed.
- **MasterTech Schedule:** Used to analyze a *series of samples which are different* and, consequently, require different analysis conditions. Samples files are user-specified; samples are transferred from the MasterTech automatically. Functional only if a MasterTech is installed.

Choose the method you wish to use and proceed accordingly.



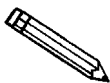
## Sample Analysis



For clarification of dialogs used in this procedure, access online help or refer to *Sample Analysis* in Chapter 6 (use the index to assist you in locating the dialog).

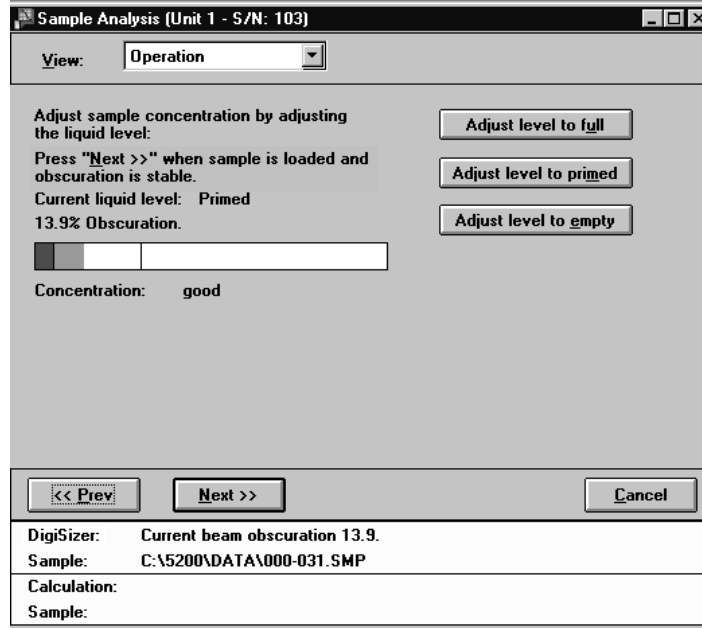
Perform the following steps to perform up to eight analyses on one sample.

1. From the **Unit** menu, select **Sample Analysis**; the Sample Analysis dialog is displayed with the Open Sample Information dialog positioned on top.
2. Choose a file for your analysis; the Sample Analysis dialog containing the parameters of the selected file is displayed.

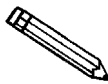


You can use **Browse...** to choose a different file if desired.

3. Verify analysis conditions and report options; edit if needed.
4. Ensure that the sample material and analysis liquid are correct; if not, use the drop-down list(s) to select the correct one(s).
5. Click **Next>>**; the beam obscuration view of the Sample Analysis dialog is displayed.



- While observing the beam concentration, slowly begin to add sample. Add enough sample to achieve the proper range for your material, using the following guidelines:

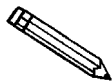


**If your DigiSizer is equipped with the low-volume sample handler, be sure the sample is deposited into the liquid and does not adhere to the sides of the reservoir.**

Sample Type	Beam Obscuration
Submicrometer	5% to 10%
1 to 100 micrometers	10% to 20%
100 to 1000 micrometers	20% to 30%

- If the beam obscuration is too high and you have chosen **Autodilute**, the concentration will be adjusted automatically until the correct beam obscuration is achieved.
  - If the beam obscuration is too low, continue to add sample.
- Click **Next>>** when the proper obscuration is achieved to begin data collection.

## QuickStart




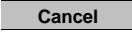
For clarification of dialogs used in this procedure, access online help or refer to *QuickStart* in Chapter 6 (use the index to assist you in locating the dialog).

Perform the following steps if you wish to perform analyses on multiple samples using the same analysis conditions.

1. From the **Unit** menu, select **QuickStart**; the QuickStart dialog is displayed.

2. Choose whether you wish to have the liquid level adjusted after each analysis before loading the next sample; if so, in which state.
  - **Full:** when a maximum quantity of liquid is desired, a flow rate higher than 12 L/min is used, or if you anticipate problems with bubbles.
  - **Primed:** for normal operation and when a limited amount of sample is available, the reservoir will be filled with just enough liquid for circulation to occur.
  - **Empty:** for previously dispersed samples already at the proper concentration.

If you deselect this option, the system will leave the liquid level unchanged.

3. Select report output:
  - a. Enter the number of reports you wish to have generated (enabled when *Printer* or *Printer/Plotter* is the destination).
  - b. Select a destination. If you choose *File*, enter a name in the **File name** field.
4. If you wish to have an identification string for this series of samples different from the one specified in sample defaults, enter a new one in the **Sample** field. Be sure to include the \$ symbol if you want the sample file number included as part of the identification.
5. In the File Management group box:
  - Choose **Prompt for files for each new sample**; a dialog allowing you to select a file for every new sample is displayed. Analysis proceeds when you add the sample and click .
  - Choose **Autodetect each new sample**; a file is created by the system using the file name sequence specified in Sample Defaults. The file will also use the same description unless you specified a different one in the previous step. Analysis proceeds each time a new sample is added to the reservoir, creating a sample file automatically.
6. After all analyses are performed click  to exit QuickStart mode.

## MasterTech Automatic



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

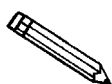


For clarification of dialogs used in this procedure, access online help or refer to *MasterTech Automatic* in Chapter 6 (use the index to assist you in locating the dialog).

Perform the following steps to analyze a series of samples of the same type using the same analysis conditions; sample files are created automatically.

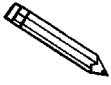
1. From the **Unit** menu, select **MasterTech Automatic**; the MasterTech Automatic dialog is displayed.

2. In the **Start with beaker** field, enter the position number of the beaker containing the first sample to be analyzed.
3. Enter the stirrer time, stirrer speed, and probe time for sample resuspension.



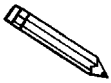
Samples tend to settle in the beaker while waiting for analysis, especially if several samples are prepared ahead of time. This option allows you to redisperse samples before analysis. Coarse materials and less stable dispersions may require a higher speed as well as more stirring and probe time than finer samples.

4. Select report output:
  - a. Enter the number of reports you wish to have generated (enabled when *Printer* or *Printer/Plotter* is the destination).
  - b. Select a destination. If you choose *File*, enter a name in the **File name** field (or accept the default).
5. In the **Sample** field, enter an identification string for this series of samples. Be sure to include the \$ symbol if you want the sample file number included as part of the identification. If you do not enter an identification string, the default identification string specified in **Sample defaults** will be used.



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

6. Click  to begin analyses; analyses of samples in consecutive beakers will continue as long as a beaker is present in the next beaker position. **Be sure to remove used beakers after analysis.**

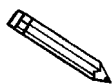


**If you wish to view the analyses in progress, select *Analysis Results* from the View drop-down list.**

## MasterTech Schedule



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

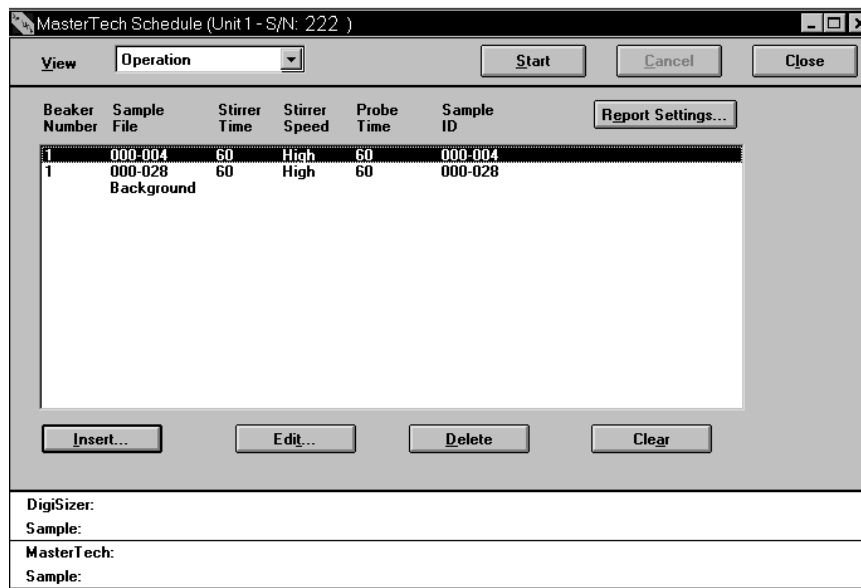


For clarification of dialogs used in this procedure, access online help or refer to *MasterTech Schedule* in Chapter 6 (use the index to assist you in locating the dialog).

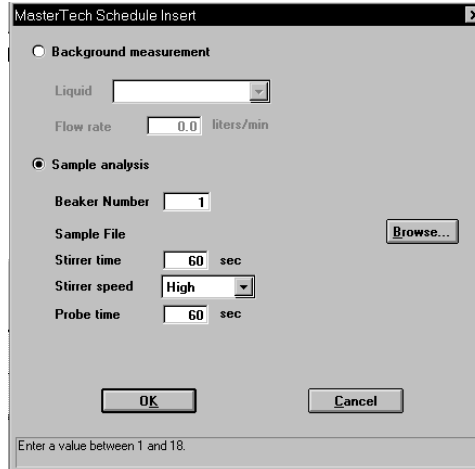
This mode of operation is used to analyze a series of samples that are different in size and shape and, consequently, require different analysis conditions. You also can schedule background measurements between samples.

Perform the following steps to use this mode of operation.

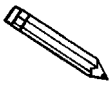
1. From the **Unit** menu, select **MasterTech Schedule**; the MasterTech Schedule dialog is displayed.



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



- a. Select *Sample analysis*.
  - b. Enter the the position number of the beaker containing the current sample.
  - c. Click **Browse...** and choose the sample file you wish to use with the sample in this beaker position.
  - d. The values contained in the fields for **Stirrer time**, **Stirrer speed**, and **Probe time** are copied from the sample file you select. You may change them if you wish.
  - e. 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.



**You can also insert a background measurement between analyses if desired.**

4. Click **Report Settings...** if you wish to have reports generated automatically after analysis.
  - a. Enter the number of reports you wish to have generated (enabled when *Printer* or *Printer/Plotter* is the destination).
  - b. Select a destination. If you choose *File*, enter a name in the **File name** field (or accept the default).
  - c. Click **OK** to close the dialog.
5. Click **Start** to begin the analyses.



## Generating a List

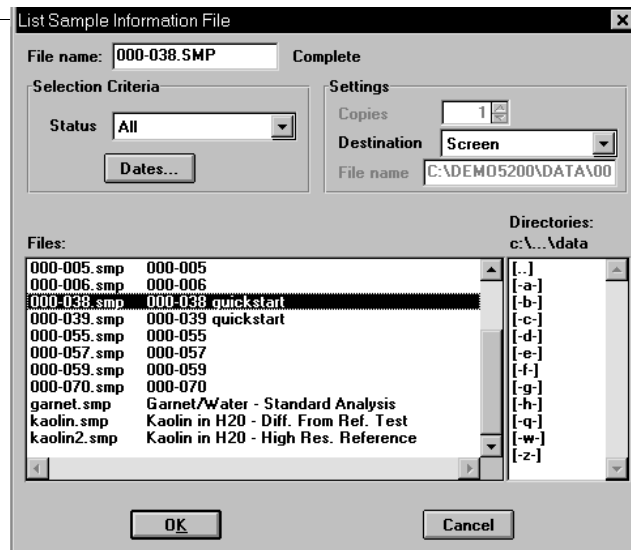
You can generate a list of the following information on one or more files:

- File name
- Date the file was created
- Time the file was created
- File identification
- File status

Perform the following steps to generate a list:

1. From the **File** menu, select **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:

Displays the type of file on which you requested a list; in this example a Sample Information File.



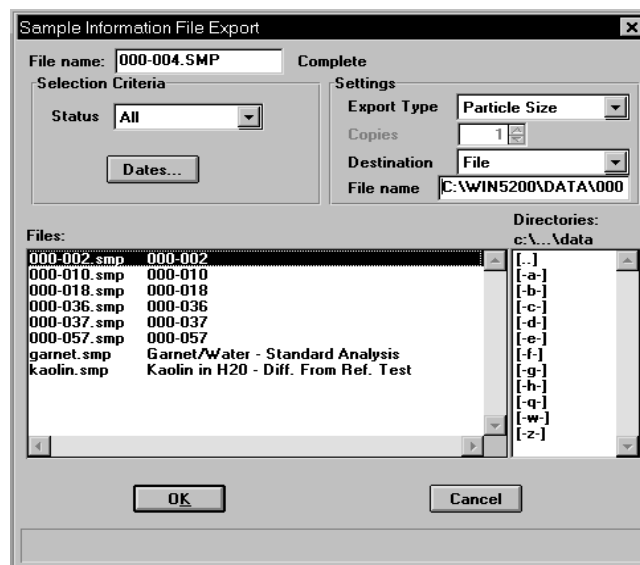
3. From the **Files:** list box, choose the desired file(s). If you wish to include all files in the list, leave all files *deselected*.
4. At the **Destination:** field, click on the down arrow and choose a destination for the list output. If you choose *File* as the destination, enter a name in the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

## Exporting a Sample Information File

Tabular data from a sample information file can be copied and exported in ASCII format. You can export either the light intensity vs. scattering angle data or the particle size distribution data. If exported and saved as a *file*, these data can be imported into applications (such as spreadsheets) accepting ASCII format. Refer to Appendix H for exporting format.

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

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



2. From the **Files:** list box, choose the file(s) you wish to export by holding down **Ctrl** and clicking on the desired files.
3. From the **Settings** group box:
  - a. Choose the export type; **Particle Size** generates particle distribution data and **Intensity** generates the light intensity vs. scattering angle data, as well as the background.
  - b. Choose a destination for your exported file. If you choose *File* as the destination, enter a name in the **File name** field (or accept the default).
4. Click **OK**, the requested file is exported and sent to the specified destination.

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## Generating Reports

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The following types of reports are available with the Saturn DigiSizer analysis program:

- Tabular and/or graphical
- Background
- Statistical process control

Refer to Chapter 7 for sample reports and ways in which to edit and change the appearance of your report.

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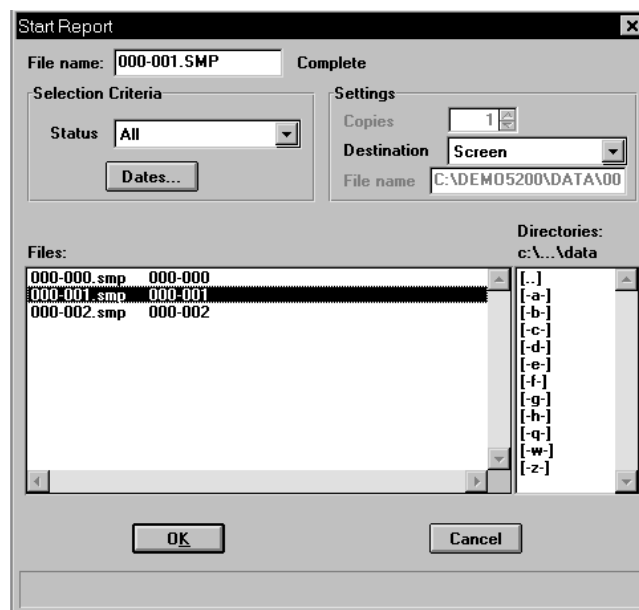
### Tabular/Graphical Reports

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Tabular and graphical reports are generated automatically (if requested) after an analysis. You can also generate reports manually if you simply wish to view a report, print additional copies, or change parameters and reprint.

Perform the following steps to generate reports manually.

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

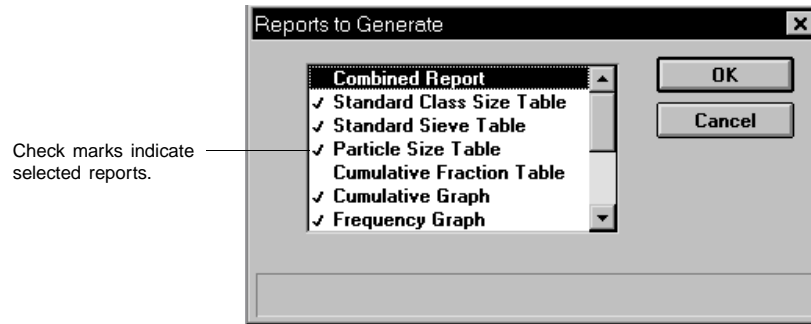


2. From the **Files:** list box, click on the name of the file(s) for which you wish to have reports generated.

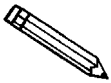
3. At the **Destination:** field, click on the down arrow and choose a destination for report output.

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

4. Click ; the Reports to Generate dialog is displayed.



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



**If you select a *Screen* destination, there are many options for manipulating reports. Refer to Chapter 7 for information on these options.**

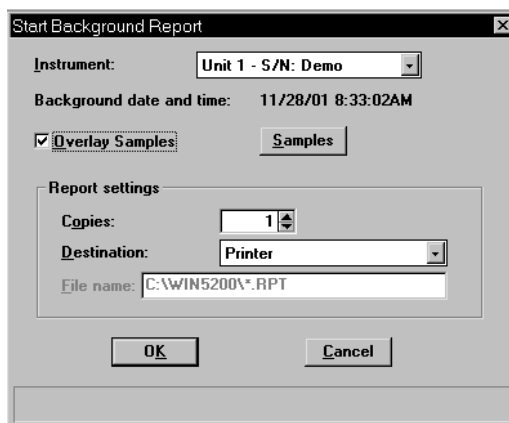
## Background Reports

A graphical report can be generated for the instrument's background. This report generates a graph illustrating light intensity versus scattering angle when no sample is present. The header of this report also contains background statistics, such as the unit serial number, date the background was performed, etc.

You can also overlay the current background with backgrounds used with other analyses for reference.

Perform the following steps to generate a background report. Refer to Background Reports in Chapter 7 for detailed information on this option.

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



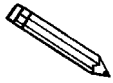
2. From the **Instrument** drop-down list, select the instrument on which you wish to have the background report generated.
3. If you wish to compare the current background with backgrounds for a sample (or multiple samples), select **Overlay Samples** and then click **Samples** to specify the desired file(s).
4. At the **Destination:** field, click on the down arrow and choose a destination for report output. Since background reports are graphical data, they cannot be printed to a *File*.
5. If you choose *Printer* or *Printer/Plotter* for the destination, enter the number of reports you wish to have generated; you can print up to four reports.
6. Click **OK**; the background report is generated and sent to the specified destination.

## Statistical Process Control Reports

Statistical process control (SPC) reports that assist you in maintaining control of a manufacturing process.

There are three types of SPC reports: Regression, Control Chart, and PSD History. Before you can generate SPC reports, 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.

### Specifying SPC Options



For clarification of the dialogs used in this procedure, access online help or refer to SPC Report Options in Chapter 7 (use the index to assist you in locating the dialog).

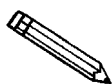
Perform the following steps to specify calculation parameters:

1. From the Reports menu, select SPC report options; the SPC Calculations dialog is displayed.

2. From the Test drop-down list, select the analysis on which you wish to report. If you select Average, an average of all analyses for the specified sample file are 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 the percentiles for the corresponding diameters.
10. If peak statistics are desired, select the peaks on which to report, then enter the minimum percent of distribution to report.
11. Click **OK** to save SPC report options.

## Generating a Regression Report



For clarification of the dialogs used in this procedure, access online help or refer to Regression Report in Chapter 7 (use the index to assist you in locating the dialog).

Perform the following steps to generate a regression report.

1. From the Reports menu, select Regression report; the Regression Report Options dialog is displayed.

Regression Report Options

Show report title: Micromeritics SPC Report

Show bitmap

Bitmap: micro.bmp [Browse...]

Height: 0.250 in Width: 2.000 in

	From	To	Autoscale
X-axis variable: Median	0.0000	1,000.0000	<input checked="" type="checkbox"/>
First graph Y-axis variable: Mode	0.0000	1,000.0000	<input checked="" type="checkbox"/>
Second graph Y-axis variable: None	0.0000	1,000.0000	<input checked="" type="checkbox"/>
Third graph Y-axis variable: None	0.0000	1,000.0000	<input checked="" type="checkbox"/>

Tabular report  Recalculate archived SPC results

Label data

Report Settings

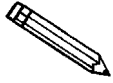
Copies: 1

Destination: Screen

File: C:\WIN5200\DATA\\*.RPT

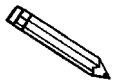
[Samples...] [Save as Default] [Report] [Cancel]

2. Select **Show report title** and enter the title you wish to appear at the top of the report (or accept the default). Deselect this option if you do not wish to have a report title.



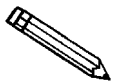
If your company logo exists as a bmp file and you wish to have it display in the report header, select **Show bitmap**. Then click  to select the file.

3. Select your X- and Y-axes variables.



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

4. Deselect **Autoscale** if you do not wish to have data scaled automatically; then enter the desired ranges.
5. Select **Tabular** if you wish to have tabular, as well as graphical, data of the included samples generated.
6. Select **Label** to have the points on the plot correspond with the sample files from which they came.
7. Click  to choose the files you wish to have reported; you can choose up to 200 files.
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. Select a destination; if you choose *File*, enter a name in the **File name** field (or accept the default). Remember, if you choose this option, only tabular reports are generated.



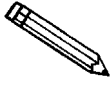
You can click  if you wish to have the selected options become the defaults for Regression reports.

10. Click ; the regression report is generated and sent to the specified destination.



## Generating a Control Chart Report

Control chart reports can be generated to illustrate process variations.

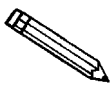


**For clarification of the dialogs used in this procedure, access online help or refer to Control Chart Report in Chapter 7 (use the index to assist you in locating the dialog).**

Perform the following steps to generate a control chart.

1. From the Reports menu, select Control chart; the Control Chart Options dialog is displayed.

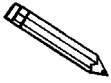
2. Select **Show report title** and enter the title you wish to appear at the top of the report (or accept the default). Deselect this option if you do not wish to have a report title.



**If your company logo exists as a bmp file and you wish to have it display in the report header, select Show bitmap. Then click **Browse...** to select the file.**

3. Choose whether you wish to have files listed in order by file name or by the time they were created.
4. Click **Graph [n]** to select Y-axis labels.

5. Select **Tabular report** if you wish to have tabular, as well as graphical, data generated.
6. 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.
7. Click  to choose the files you wish to have reported; you can choose up to 200 files.
8. Select a destination; if you choose File, enter a name in the File name field (or accept the default). Remember, if you choose this option, only tabular reports are generated.

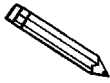


You can click  if you wish to have the selected options become the defaults for Regression reports.

9. Click ; the control chart report is generated and sent to the specified destination.

## Generating PSD History Report

PSD History reports allow you to generate a sequence of particle size distributions on up to 200 files.



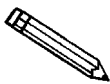
**For clarification of the dialogs used in this procedure, access online help or refer to PSD History in Chapter 7 (use the index to assist you in locating the dialog).**

Perform the following steps to generate a PSD History report:

1. From the Reports menu, select **PSD history**; the PSD History Options dialog is displayed.

Click this push button to save the current definitions as the default.

2. Select **Show report title** and enter the title you wish to appear at the top of the report (or accept the default). Deselect this option if you do not wish to have a report title.



**If your company logo exists as a bmp file and you wish to have it display in the report header, select Show bitmap. Then click **Browse...** to select the file.**

3. Choose whether you wish to have the X-axis order by Time or File name.
4. Click **Samples** to choose the files you wish to have reported; you can choose up to 200 files.
5. Choose the report destination and click **Report**; the report is generated to the specified destination.

## Generating Overlays

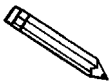
Use the overlay function when you wish to compare graphically multiple graph options. Overlays may be generated in three ways:

- 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. Examples of each type of overlay are shown in Chapter 7.

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:

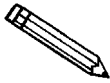


**You can also overlay multiple graphs from the same sample file using the options provided in the report subsystem (refer to Chapter 7).**

1. From the File menu, select Open, Sample information. Then choose the desired sample file. If your window is presented in the Basic format, click **Advanced**.
2. Select the Report Options tab; the report options dialog is displayed.
3. 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.

If...	Then...
You are defining report options:	Select which test you wish to use.
	In the Reports to Generate list box, select the graph(s) you wish to overlay with other graph(s).
	Click <input type="button" value="Edit..."/> for each requested graph; a Graph Options dialog is displayed.
	From the Overlay drop-down list, choose the type of graph you wish to overlay; then click <input type="button" value="OK"/> .



**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.**

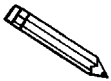
4. From the Reports menu, select **Start report**; the Start Report dialog is displayed. Your file should be highlighted and in the File name field.
5. Choose your print destination.
6. Click  ; the Reports to Generate dialog is displayed, allowing you to change report selection if you wish.
7. Click  ; requested overlays are generated and sent to the specified destination.

To overlay the same type of graph(s) on multiple samples:

1. From the File menu, select Open, Sample information. Then choose the desired sample file. If your window is presented in the Basic format, click **Advanced**.
2. Select the Report Options tab; the report options dialog is displayed.
3. 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:	From the Test drop-down list, select the test (analysis) of this sample file for which you wish to have results reported.  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 6.
	In the Reports to Generate list box, select the graph(s) you wish to overlay.
	Click <b>Edit...</b> for each selected report; A Graph Options dialog is displayed.
	Ensure that Samples is selected in the Overlays field.
	Click <b>OK</b> ; the Report Options dialog again is displayed.

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



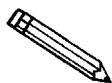
**You do not have to save these options before generating overlay reports. If you do save, the report options for your original sample file will be replaced with the new ones.**

7. From the Reports menu, select **Start report**; the Start Report dialog box is displayed. Your file should be highlighted and in the File name field.
8. Choose your print destination.
9. Click ; the Reports to Generate dialog box is displayed, allowing you to change report selection if you wish.
10. Click ; 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. From the File menu, select Open, Sample information. Then choose the desired sample file. If your window is presented in the Basic format, click  .
2. Select the Report Options tab; the report options dialog is displayed.
3. Use one of the following methods:

If...	Then...
You are using a predefined Report Options file:	Click <input type="button" value="Replace..."/> and choose the report options file you wish to use.
You are defining report options:	In the Reports to Generate list box, select the graph(s) you wish to overlay.
	Click <input type="button" value="Edit..."/> for each selected report; A Graph Options dialog box is displayed.
	Ensure that Tests is selected in the Overlays field.
	Click <input type="button" value="OK"/> ; the Report Options dialog again is displayed.



**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.**

4. From the Reports menu, select Start report; the Start Report dialog box is displayed. Your file should be highlighted and in the File name field.

5. Choose your print destination.
6. Click ; the Reports to Generate dialog box is displayed, allowing you to change report selection if you wish.
7. Click ; requested overlays are generated and sent to the specified destination.



# CHAPTER 5

## FILE MENU

---

- Description
- Open
- Save
- Save As
- Save All
- Close
- Close All
- Print
- List
- Export
- Exit



---

## FILE MENU

---

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

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### Description

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

<b>Open</b>	Opens an existing file or allows you to create a new one. Four types of files are available: Sample information, Analysis conditions, Material 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 sample 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 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>Exit</b>	Exits the analysis program.

---

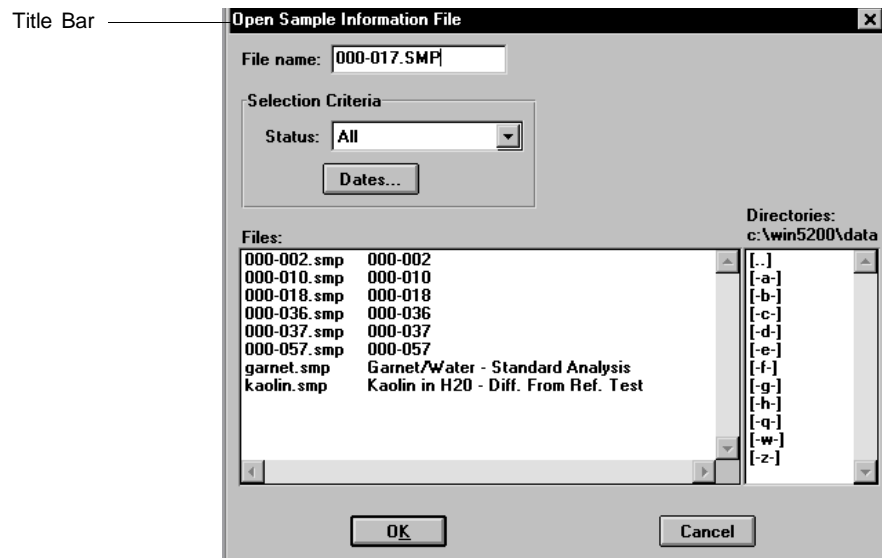
## Open

---

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

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

The Open dialog is common to all four types of files. The title bar will display the type of file you are opening. The example shown here is the Sample Information File.



### File name

For *sample information files*, this field contains the next sequenced file name generated by the system in the format specified in Sample Defaults (Chapter 8).

- » **To create a file:** accept the default or enter an appropriate name and click .
- » **To open a file:** select the desired file from the **Files** window and click .

For *parameter files*, this field contains the wild card (\*) and a default extension as follows:

- \*.ANC for analysis conditions
- \*.MTP for material properties
- \*.RPO for report options

**File name**  
(continued)

- » **To create a file:** enter an appropriate name (up to eight characters) and click  .
- » **To open a file:** select the desired file from the **Files:** window and click  .

Refer to **Selecting Files** in Chapter 3 for a description of the options in the **Selection Criteria** group box.

## 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 can also edit an existing sample information file. A sample information file consists of five parts:

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

Portions 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, material and dispersant properties, and report options which may be conveniently loaded into a new sample information file. They also may be edited as required.

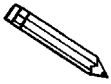
Sample information files are presented in three formats:

- **Basic**  
Presents all parts of the sample information file as a single dialog. With this format, you can quickly create a sample information file using previously defined analysis conditions and report options files. This format also allows you to switch easily to the Advanced format if you need to edit any part of the file. This format is the one most frequently used.
- **Advanced**  
Presents all five parts of the sample information file in a 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.
- **Restricted**  
This format is identical to the Basic format except that you cannot switch to the Advanced format for editing and certain functions are disabled.

Select **Options presentation** from the **Options** menu to specify the format most suitable for your laboratory's use.

## Basic

The Basic format displays all parts (parameters) of the sample information file on a single dialog. This format allows you to create a sample information file using predefined parameter files. It is quick, easy, and the most popular format among Saturn DigiSizer users. If you wish to view or edit specific parameters of the sample file, you can switch easily to the Advanced format by clicking **Advanced**.



**Chapter 4 provides step-by-step instructions for creating a sample information file using the Basic format.**

### Sample

Contains the description of the current sample file.

If this is a new file, this field contains the next sequenced file description based on the format you specified in **Sample defaults** (Chapter 8).

» You can enter a new description or add to the existing one if desired.

*Range: 50 alphanumeric characters*

### Analysis Conditions

Contains the name of the current Analysis Conditions file.

If this is a new file, this field contains the name of the file you specified as the default.

**Analysis Conditions***(continued)*

- » Click on the down arrow to choose a different file. This list contains files supplied with the analysis program as well as files you create and save to the directory specified as the Parameter File directory (Chapter 8). If new files are not saved to the specified directory, they are not included in the list.
- » This list is disabled for files which have been used for an analysis.

**Autodilute**

Enables monitoring of the sample's concentration and adds liquid as needed to attain the appropriate concentration before analysis and data collection begin.

**Number of tests**

Enter the number of analyses you wish to perform using this sample file; you can perform up to eight tests with one file.

**Rinse**

Allows rinsing of the cell, the tubing, and the reservoir after each analysis. We recommend this option remain selected. If you deselect this option and rinses are not performed after analysis, inaccurate results may be obtained on subsequent analyses.

**Sample**

Displays the type of sample material that was analyzed using the current file.

If this is a new file, this field contains the name of the material you specified as the default.

- » Click on the down arrow to choose a different sample material from the list.
- » You can add sample materials to this list by switching to the Advanced format.



**Liquid**

Displays the dispersing liquid used in the analysis for the current file.

If this is a new file, this field contains the dispersing liquid you specified as the default.

- » Click on the down arrow to choose a different liquid from the list.
- » You can add dispersing liquids to this list by switching to the Advanced format.

**Report Options**

Contains the name of the current Report Options file.

If this is a new file, this field contains the Report Options file you specified as the default.

- » Click on the down arrow to choose a different file. This list contains files supplied with the analysis program as well as files you create and save to the directory specified as the Parameter File directory (Chapter 8). If new files are not saved to the specified directory, they are not included in the list.

**Reports to Generate**

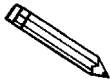
Displays a list of available reports. Select reports by double-clicking on the desired report. Alternatively, you can highlight the report and press the . A selected report is preceded with a check mark (✓). Reports are deselected in the same manner.

- » Certain parameters of some reports can be edited by switching to the Advanced format.

Click this push button to replace all parameters of the current sample file with those from another one.

## Advanced

The Advanced format displays the sample information file in a tabbed dialog. Each parameter has its own tab and is accessed by clicking its tab. Or, you can use **<< Prev** and **Next >>** to move through the dialogs. This format allows you to customize sample files.



**Chapter 4 provides step-by-step instructions for creating a sample information file using the Advanced format.**

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

### Sample

Contains the description of the current sample information file.

If this is a new file, this field contains the next sequenced file description based on the format specified in Sample defaults (see Chapter 8).

- » You can enter a new description or add to the existing one if desired.
- » This field may be edited to display a different label or omitted entirely through Sample defaults.

*Range: 50 alphanumeric characters*

**Operator  
Submitter**

Displays the Operator and Submitter names (if specified) of the current sample file.

If this is a new file, these fields contain the names specified in Sample defaults.

- » You can enter a different name for either (or both) fields if desired.
- » Either (or both) of these fields may be edited to display different labels or omitted entirely using the **Sample defaults** option on the **Options** menu.

*Range: 40 characters*

**Type of Data**

Displays the type of data for the current sample file.

If this is a new file, choose whether you wish to have data collected automatically or whether you wish to enter data.

**User Parameters**

These fields are used specifically for SPC (Statistical Process Control) reporting. The parameters on which you wish to report are specified by selecting **Sample defaults** from the **Options** menu (Chapter 8). The parameter(s) you specify will replace the *User Parameter* label(s) displayed here.

- » If SPC reporting is not desired, you can specify to have these fields omitted from the sample information file.

**Comments**

Allows you to enter comments about the sample or its analysis conditions. Anything you enter in this window is printed in the header of the report.

**Add Log Entry**

Allows you to enter comments about the sample or its analysis conditions. Anything you enter using the dialog displayed by this push button appears in the Instrument Log Report; it does not display on the report header.

**Replace all**

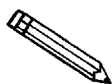
Click this push button to replace all parameters of the current sample file with those from another one.

## Restricted

When you open an existing sample information file or create a new one using the Restricted format, all parts of the sample file are displayed in the same manner as the Basic format. Some menu functions, however, are disabled and you are unable to switch to the Advanced format. You also must enter a password to access the Restricted format (refer to Chapter 8) or to switch to another format when in the Restricted mode.

## Analysis Conditions

The Analysis Conditions dialog allows you to specify analysis conditions for your sample. You can create an Analysis Conditions file as an independent parameter file or include it as part of the sample information file.



**If this is a parameter file and you want it to be included in the drop-down list of the Basic Sample Information dialog, be sure to save it to the directory specified as the Parameter Files directory (see Parameter Files Directory, Chapter 8).**

### Analysis Conditions

Contains the description of the current Analysis Conditions file.

If this is a new file, this field contains the name you specified as the default.

- » You can enter a new description or add to the existing one if desired. Be sure to use an intuitive name (perhaps one that characterizes the analysis conditions) so that it can be easily recognized when needed.

*Range: 40 alphanumeric characters*

**Replace...**

Select to choose a file containing parameters you wish to copy and use in the current file.

- » Select the desired file, click **OK**; the values are copied automatically and inserted into the current file.
- » You can edit the values in the new file without affecting the values in the file from which they were copied.

### **Flow rate group box**

Displays the flow rate conditions for the current sample file.

If this is a new file, use the options in this group box to specify flow rate requirements.

### **Set flow rate**

Select this option to enter a flow rate or have the flow rate calculated automatically.

Select **Enter**; the **Flow rate** field is enabled so that you can enter a specific flow rate.

Select **Auto calculate**; the **Maximum particle size** field is enabled so that you can enter the estimated maximum particle size of your sample. This enables you to set a flow rate large enough so that no sampling error (due to a slow flow rate) is introduced.

- » If you deselect this option, the previous flow rate (typically, from the previous analysis) is used.

**Redispersion group box**

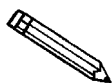
Displays redispersion parameters for the current sample file.

If this is a new file, use the options in this group box to specify redispersion parameters.

**Ultrasonic probe**

Select this option if you are using an ultrasonic probe.

In the **Intensity** field, enter the percent of intensity at which to have the ultrasonic probe operate. In the **Time** field, specify how long the sample is to be agitated before each analysis. Or you can select **On during test** to have the probe operate during analysis.



**Coarse materials and less stable dispersions may require more agitation than finer materials.**

**Circulate before data collection**

Circulates the analysis liquid through the system after you have added the sample. Enables the **Circulation time** field so that you can enter how long the sample circulates before analysis and data collection begin.

**Redisperse before each test**

Redisperses the sample just before each test (analysis) is performed. You can perform up to eight tests with one sample file.

**Obscuration**

Displays details of the beam obscuration criteria.

**Minimum Maximum**

These fields allow you to specify a recommended range for the beam obscuration. The range you specify will be used on the obscuration bar graph during sample loading. Refer to Appendix B for guidelines on appropriate obscuration levels for various particle sizes.

**Autodilute to**

Allows monitoring of the sample's concentration and adds liquid as needed to attain the appropriate concentration before analysis and data collection begin.

**Data Collection**

Specify the beam angle at which to stop data collection.

- » Lower beam angles produce shorter analysis times.
- » Lower beam angles can be used for samples that do not contain small particles.
- » Higher beam angles allow smaller particles to be detected.

Generally, the default of 45° is suitable for most samples.

**Number of tests**

Enabled when the current file has not been used for its maximum number of analyses. Enter the number of tests (analyses) you wish to perform using this sample file; you can perform up to eight tests with one file.

**Rinse after analysis**

Deselect this option if you wish to examine the reports before proceeding with, perhaps, further tests on the file or further dispersion. If this is the case, however, you should perform a rinse using the option on the **Unit [n]** menu or select a sample file and enable the **Rinse after analysis** option to prepare for the next analysis.

Select this option to rinse the cell, the tubing, and the reservoir after each analysis.

*Autorinse* rinses the system until a beam obscuration of 0.1 or less is attained.

**If your analysis and rinse liquids are the same,** rinsing stops when:

- No significant decrease in beam obscuration is attained twice in a row, displaying an error message. (Appendix A lists actions for the displayed error message.)
- The system has performed 10 rinses and was unable to attain 0.1 or less; an error message is displayed. Appendix A lists actions for the displayed error message.

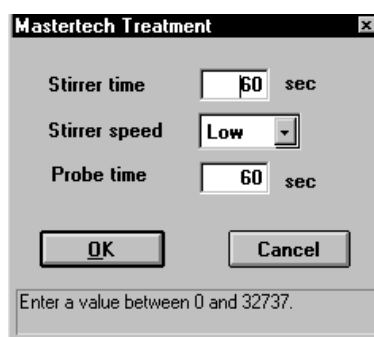
**Rinse after analysis***(continued)***If your analysis and rinse liquids are different,**  
rinsing stops when:

- Successive rinses show no significant decrease in beam obscuration. If the beam obscuration is greater than 1.0, an error message is displayed. (Appendix A lists actions for the displayed error message.) If the beam obscuration is less than 1.0, it is assumed to be due to the difference in liquids and operation continues.
- The system has performed 10 rinses and was unable to attain a beam obscuration of less than 0.1, displaying an error message. (Appendix A lists actions for the displayed error message.)

*Rinse cycles* allow you to specify an exact number of rinses to perform.

**MasterTech Treatment...**

Displays the Mastertech Treatment dialog so that you can specify the stirrer time, stirrer speed, and probe time for the MasterTech.



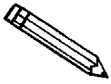
Samples tend to settle in the beakers while waiting for sample analysis, especially if they are prepared in advance (as in most cases when using a MasterTech). The options in this dialog allow you to program the MasterTech stirrer and probe to redisperse the sample prior to analysis.

- » This option is relevant only if using this sample file in a MasterTech analysis.



## Material Properties

This dialog allows you to specify the properties of the sample material being analyzed and the dispersing liquid in which it is dispersed. A Material Properties file can be created as an independent parameter file or included as part of the sample information file.



**If this is a parameter file and you wish to include it in the drop-down list of the Basic Sample Information dialog, be sure to save it to the directory specified as the Parameter Files directory (see Parameter Files Directory, Chapter 8).**

### Material Properties

Contains the description of the current Material Properties file.

If this is a new file, this field contains the description you specified as the default.

- » You can enter a new description or add to the existing one. Be sure to use an intuitive name (one that characterizes the material properties) so that it can be easily recognized when needed.

*Range: 40 alphanumeric characters*

**Replace...**

Select to choose a file containing parameters you wish to copy and use in the current file.

- » Select the desired file, click **OK**; the values are copied automatically and inserted into the current file.
- » You can edit the values in the new file without affecting the values in the file from which they were copied.

## Sample Material

Displays a list of available sample materials. After you select a sample material from the list, its description and properties are displayed.

### Description

Displays the sample material you select from the list. This field is also used to add sample materials to the list.

### Refractive Index

Displays the real and imaginary portions of the refractive index for the selected material.

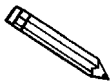
### Density

Displays the density of the selected material.

**Add**

Enables you to add sample materials to the list.

- » In the **Description** field, enter the name of the sample material you wish to add.
- » In the **Density** field, enter the density of the material you are adding.
- » In the **Refractive Index** fields, enter the real (**Re**) and imaginary (**Im**) portions of the refractive index.
- » Click **Add**.



**Density and refractive index values can be obtained from a laboratory handbook.**

**Add**

*(continued)*

This push button is also used to change density and/or refractive index values for a sample material.

- » Select (highlight) the sample material you wish to edit.
- » Enter the new value(s) in the appropriate field(s).
- » Move the mouse pointer to another field; observe that **Add** changes to **Change**.
- » Click **Change**; the values are changed.

**Delete**

Deletes the selected sample material from the list.

### **Analysis Liquid**

Displays a list of available analysis (dispersing) liquids. After you select a liquid from this list, its description and properties are displayed.

#### **Description**

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.

#### **Refractive Index**

Displays the refractive index (real portion) of the selected analysis liquid.

#### **Viscosity**

Displays the viscosity of the selected analysis liquid.

#### **Density**

Displays the density of the selected analysis liquid.

**Add**

Enables you to add analysis liquids to the list.

- » Analysis liquids are added in the same manner as sample materials.

**Delete**

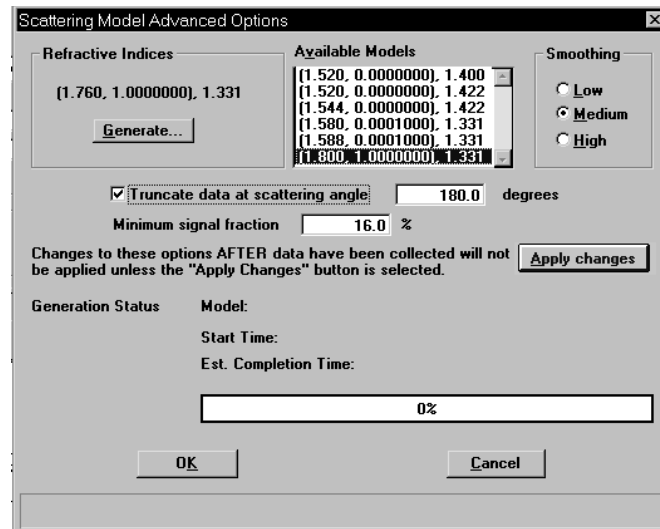
Deletes the selected analysis liquid.

## Scattering Model

Displays the refractive indices for the sample material (real and imaginary) and analysis liquid, as well as the model chosen by the system to be the closest match.

### Options

Use this push button to select a different model or to generate a new one; the Scattering Model Advanced Options dialog is displayed.



You can choose a different model from the **Available Models** list, as well as specify the type of smoothing desired.

**Low** should be used when high resolution is desired, and your sample material consists of near-perfect spheres with accurately known refractive indices.

**Medium** is the default and typically is appropriate for most materials.

**High** should be used for (1) materials in which an accurate refractive index is unknown, or (2) materials that differ greatly from the Mie scattering patterns (nonhomogeneous materials or materials that have a large aspect ratio in particle shape).

If a suitable model is unavailable, you can click **Generate...** to create a new model. When you generate a new model, its progress is displayed across the lower portion of the dialog. Generation times vary, depending on computer speed. Typically for a 333 megahertz computer, generating a new model takes approximately 20 minutes.

**Options**

*(continued)*

**Truncate data at scattering angle**

Choose this option to truncate the intensity data used in fitting the model; data will be truncated at the angle specified in the adjacent field.

**Minimum signal fraction**

This field allows you to restrict intensity data used in fitting the model based on a percentage due to sample scattering rather than background.

**Apply Changes**

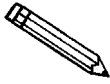
Enabled when the changes requested in this dialog are to a file that has been used in a completed analysis. You must select this push button to apply the changes in fitting the model to the data from all tests used with the file.

**OK**

Enabled when the changes you requested in this dialog are to a file that has not been used in an analysis. Clicking this push button saves the changes.

## Report Options

This dialog allows you to specify report options for a new file or to edit an existing one. A report options file can be created as an independent parameter file or included as part of the sample information file.



**If this is a parameter file and you want it to be included in the drop-down list of the Basic Sample Information dialog, be sure to save it to the directory specified as the Parameter Files directory (see Parameter Files Directory, Chapter 8).**

### Report options

Contains the description of the current Report Options file. You may change the description if you wish.

If this is a new file, this field contains the description you specified as the default.

- » You can enter a new description or add to the existing one if desired. Be sure to use an intuitive name (one that characterizes the report options used) so that it can be located easily when needed.

*Range: 50 alphanumeric characters*

**Replace...**

Allows you to copy parameters of an existing file and use them in the current one.

- » Select the desired file, click **OK**; the values are copied automatically and inserted into the current file.
- » You can edit the values in the new file without affecting the values in the file from which they were copied.

### Show report title

This option allows you to enter a title for your report.

If this is a new file, the title you specified as the default is displayed. Accept the default title or enter a different one.

- » Deselect this option to omit the report title.

*Range: 40 characters.*

### Show graphic

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

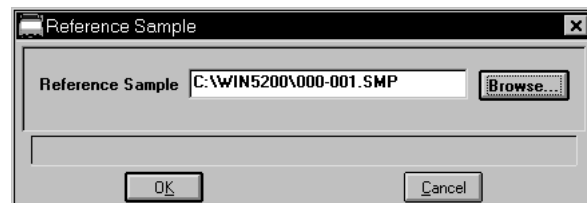
- » Click **Browse...** to choose the graphic.
- » Enter the height and width you wish the image to be.
- » The image can also be edited from the report window.

### Distribution Type

Select the type of distribution data you wish to report. You can report *Volume*, *Area*, or *Number*.

**Reference...**

Displays the Reference Sample dialog so that you can specify a sample file with which to compare analysis results of the current sample; produces a Difference of Reference report.

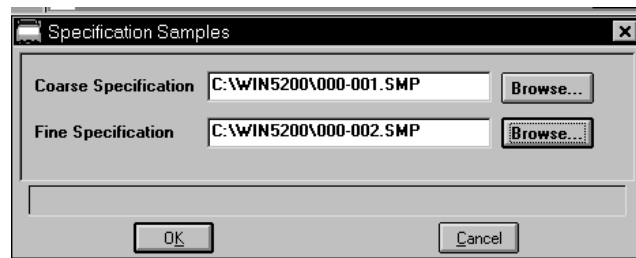


**Reference...**  
(continued)

- » Click **Browse...** to display the Reference Sample File Selection dialog box.
- » Choose the file you wish to use for the difference in reference calculation, then click **OK**; the file name is copied to the Reference Sample dialog.

**Specification...**

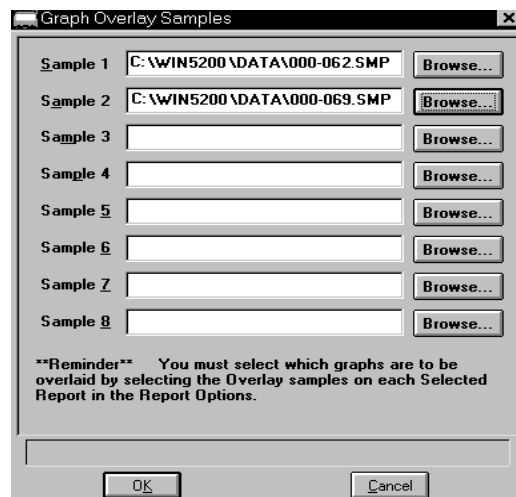
Displays the Specification Samples dialog so that you can specify the sample files to be used for the boundaries of the coarse and fine specifications; produces an Out of Specification report. Then you can quickly determine if the results of the current sample are within the specified boundaries.



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

**Overlays**

Displays the Graph Overlay Samples dialog so that you can choose the sample files containing the data you wish to overlay onto a selected plot.





**Overlays**

(continued)

- » Click **Browse...** to the right of the sample number field; choose the desired file, then **OK** .
- » You can select up to eight files. Refer to Chapter 4 for step-by-step instructions on generating overlays.

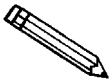
**Test**

Use this drop-down list to specify which test (analysis) you wish to have a report generated for.

**Reports to Generate**

Contains a list of available reports.

- Combined Report
- Standard Class Size Table
- Standard Sieve Table
- Particle Size Table
- Cumulative Fraction Table
- Cumulative Graph
- Frequency Graph
- Difference from Ref(erence) Graph
- Out of Spec(ification) Graph
- Surface Area
- Surface Area Population
- Background Graph
- Goodness of Fit Graph
- Rosin Rammler
- Summary
- Sample Log



**You can find printed examples of these reports in Chapter 7.**

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

- » Select reports by double-clicking on the desired report(s). Alternatively, you can highlight the desired report and press **Spacebar** .
- » You may *deselect* reports in the same manner.

Edit...

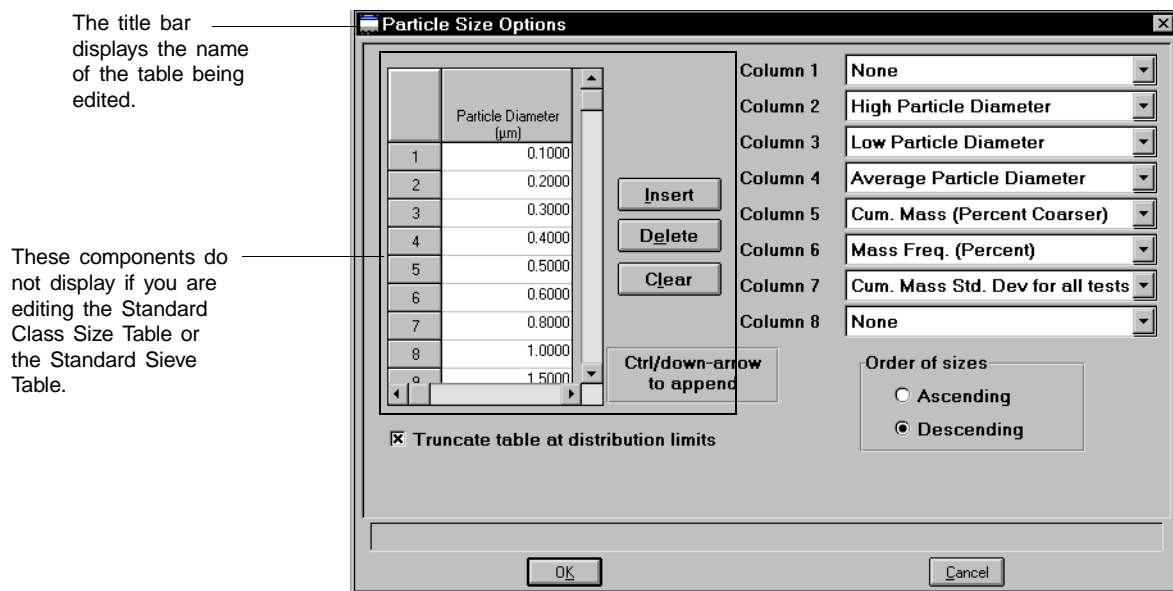
Allows you to edit values of the selected report.

This push button is disabled for the following reports; they cannot be edited:

- Rosin Rammler
- Sample Log

### Editing Tables

Select a table to edit; a dialog similar to this one is displayed.



The Standard Class Size Table and the Standard Sieve Table are fixed and, therefore, do not contain a table nor push buttons.

- » The Standard Class Size Table is fixed based on 40 classes per decade (refer to Appendix G for data reduction information).
- » The Standard Sieve Table is fixed based on the sieves you specify using the **Data presentation, Sieve Table** option on the **Options** menu (Chapter 8).



**Table**

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

- » Not included on the dialogs for the Standard Class Size Table and the Standard Sieve Table.

**Insert**

Inserts a point above the selected point.

- » Use **Ctrl**  to add points at the beginning of the table and **Ctrl**  to add points at the end of the table.
- » Not included on the dialogs for the Standard Class Size Table and the Standard Sieve Table.

**Delete**

Deletes the selected point.

- » Not included on the dialogs for the Standard Class Size Table and the Standard Sieve Table.

**Clear**

Clears all but the one required point from the table.

- » Not included on the dialogs for the Standard Class Size Table and the Standard Sieve Table.

**Column [n]**

Use the options from the drop-down lists to choose the type of data you wish to display in report columns.

**Order of Sizes**

Choose whether you wish to have points collected in an ascending or descending order.

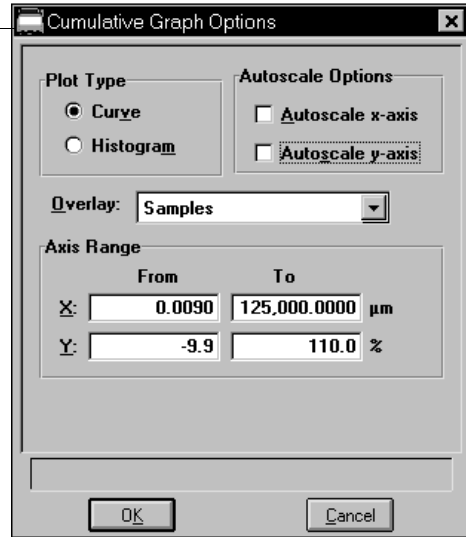
**Truncate table at distribution limits**

Select this option to have the table shortened to the limits of the distribution.

## Editing Graphs

Select a graph to edit; a dialog similar to this one is displayed.

The title bar displays the name of the graph being edited.



### **Plot Type**

Choose whether you wish to have plotted graphs display as curves or histograms.

### **Autoscale Options**

Select these options to have the X- and/or Y-axis scaled automatically. Both axes begin at zero; the highest values collected during analysis are the ending points. The **Axis Range** fields are disabled if you choose to autoscale data.

If you choose not to autoscale data, the field(s) in the Axis Ranges group box become enabled so that you can enter the range(s) for the X- and/or Y-axes.

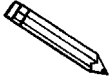
### **Overlay**

Click on the down arrow to display the types of overlays available.

- » Choose *Samples* to overlay the same type of curve from a different data reduction. Then click **Overlays** on the Report Options dialog to choose the sample file(s).
- » Choose *Tests* if you plan to overlay the same type of curve from all tests performed with this file.
- » Choose a different *report variable* to overlay with the selected variable (the one you are editing).

**Axis Range**

Enabled when *Autoscale* is deselected so that you can specify beginning and ending values for the X- and Y-axis ranges. Data collected outside the specified 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.

**Editing the Background Graph**

Select Background to edit; the Background Options dialog is displayed.



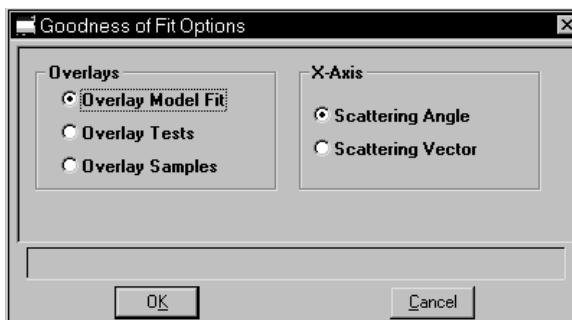
Choose **No Overlays** to report the background of this sample analysis only.

Choose **Overlay Samples** to overlay the background of this sample analysis with the background(s) of other analyses. Then click **Overlays** on the Report Options dialog to choose the sample file(s).

Choose **Overlay Current Background** to overlay the background of this sample analysis with the current background of the analyzer.

### Editing the Goodness of Fit Graph

Select Goodness of Fit Graph to edit; the Goodness of Fit Options dialog is displayed.



The options on this dialog allow you to specify the X-axis variable as well as the type of overlay.

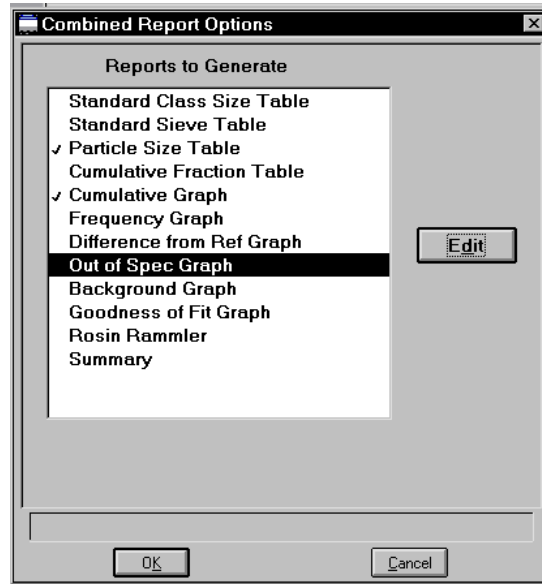
Choose **Overlay Model Fit** to overlay the collected intensity data of this sample with the model fit.

Choose **Overlay Tests** to overlay the collected intensity data for all analyses (tests) used with this sample file.

Choose **Overlay Samples** to overlay the collected intensity data of this sample with that of another sample (or multiple samples). Then click **Overlays** on the Report Options dialog to choose the sample file(s).

### **Editing the Combined Report**

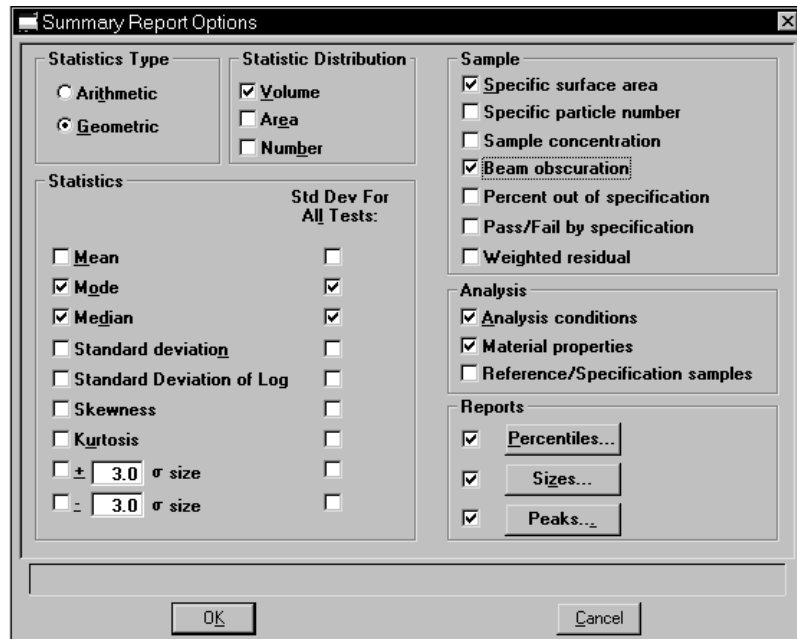
Select the Combined Report to edit; the Combined Report Options dialog is displayed.



The list of reports for the Combined Report is almost identical (the Combined report, of course, is not included in this list) to the list of reports generated in the normal manner. The difference is that the reports generated from the selections on this dialog contain no page breaks or headings. And, unless too many are selected, all reports display on one page.

## Editing the Summary Report

Select the Summary Report to edit; the Summary Report Options dialog is displayed.



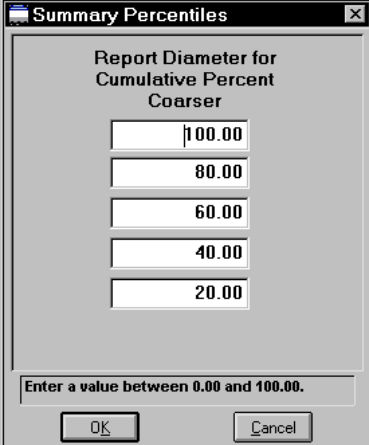
The Summary Report provides a condensed listing of analysis statistics and data results.

<b>Statistics Type</b>	Select whether you wish to have Arithmetic or Geometric statistics.
<b>Statistic Distribution</b>	Choose the type(s) of distribution(s) you wish to report.
<b>Statistics</b>	Select the variables you wish to include in the report.
<b>Sample</b>	Select the sample statistics you wish to include in the report.
<b>Analysis</b>	Select the analysis parameters you wish to include in the report.
<b>Reports</b>	Select the type(s) of report data you wish to include in the report.



**Percentiles...**

Displays the Summary Percentiles dialog.

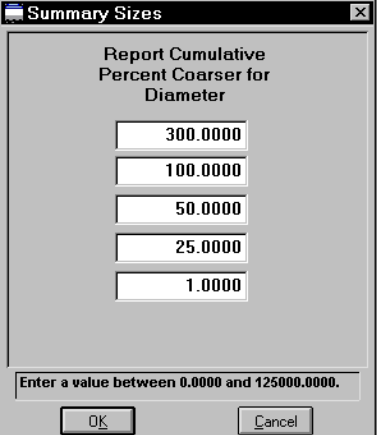


The dialog box is titled "Summary Percentiles" and contains the following text: "Report Diameter for Cumulative Percent Coarser". Below this text are five input fields with the following values: 100.00, 80.00, 60.00, 40.00, and 20.00. At the bottom of the dialog, there is a text box that says "Enter a value between 0.00 and 100.00." and two buttons labeled "OK" and "Cancel".

This dialog allows you to report the particle diameter (or radius) corresponding to each specified coarser (or finer) percentile. You can enter up to five values in any order. If you enter zero (0.00), a blank line is shown on the report.

**Sizes...**

Displays the Summary Sizes dialog.



The dialog box is titled "Summary Sizes" and contains the following text: "Report Cumulative Percent Coarser for Diameter". Below this text are five input fields with the following values: 300.0000, 100.0000, 50.0000, 25.0000, and 1.0000. At the bottom of the dialog, there is a text box that says "Enter a value between 0.0000 and 125000.0000." and two buttons labeled "OK" and "Cancel".

This dialog allows you to report the cumulative percent (or fraction) coarse (or finer) for each specified diameter (radius). You can enter up to five values in any order. If you enter zero (0.00), a blank line is shown on the report.

**Peaks...**

Displays the Summary Peaks dialog.

Summary Peaks

Minimum percent of distribution to report

Column 1

Column 2

Column 3

Column 4

Column 5

Column 6

Column 7

Column 8

Value of N for the "+ N σ" column

Value of N for the "- N σ" column

Enter a value between 0.0 and 100.0.

OK Cancel

This dialog allows you to report selected variables for each peak of the analysis meeting the specified minimum percent (or fraction).

## Sample Log Report

---

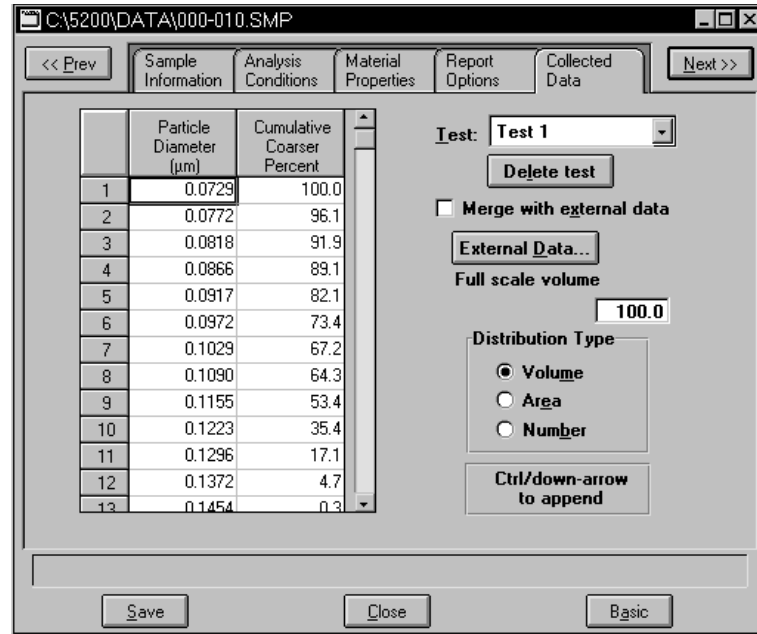
The Sample Log report provides the following statistics:

- manual control operations performed during analysis
- information entered using **Add Log Entry** on the sample file editor
- warnings and/or errors that occurred during analysis

## 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 may display as Collected Data or Entered Data.

### Collected Data



#### Table

Displays the data points collected for the current test. If this is a new file, the table will contain no valid data.

#### 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. If this is a new file, this field is disabled.

Delete test

Allows you to delete the test in the **Test** field if desired. This push button is disabled if this is a new file.

#### Merge with external data

Select this option to merge data collected by manual methods with the data collected from the current test.

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	99.0
2	No. 270	53	99.0
3	No. 120	125	99.0
4	No. 50	300	99.0
5	No. 25	710	99.0
6	No. 12	1700	99.0
7	No. 5	4000	99.0
8	5/16 in.	8000	99.0
9	5/8 in.	16000	99.0
10	1 1/4 in.	31500	99.0
11	2 1/2 in.	63000	99.0
12	5 in.	125000	99.0

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

	Particle Diameter (µm)	Cumulative Coarser Percent
1	0.1000	100.0
2	0.2000	0.0
3	0.3000	0.0
4	0.4000	0.0

Insert

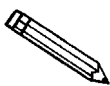
Inserts a row so that you can enter pertinent data.

Delete

Deletes the selected row.

Clear

Clears the entire table of all but the one required entry.



**These push buttons are disabled for the Sieve table. Sieve sizes are specified by selecting Data presentation, Sieve table from the Options menu.**

### Size Type

Allows you to choose the type of data you wish to merge.

*Particle size* allows you to enter the particle diameter as well as the cumulative percent for the sample.

*Sieve size* allows you to enter the percent passed through each specified sieve.

### Distribution Type

Specify the type of external data you plan to merge.

**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**

Specify the weight percent of the sample actually analyzed by the Saturn analyzer versus the percent that is manually analyzed. The data are scaled accordingly.

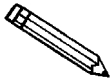
Use this option if you analyzed part of the sample by another method but you do not wish to merge those results with the reports for the current test.

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. 500	25	100.0
3	No. 450	32	100.0
4	No. 400	38	100.0
5	No. 325	45	100.0
6	No. 270	53	100.0
7	No. 230	63	100.0
8	No. 200	75	100.0
9	No. 170	90	100.0
10	No. 140	106	100.0
11	No. 120	125	100.0
12	No. 100	150	100.0
13	No. 50	300	100.0

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

	Particle Diameter (µm)	Cumulative Coarser Percent
1	0.1000	100.0
2	0.2000	0.0
3	0.3000	0.0
4	0.4000	0.0

### Table

Enter pertinent data.

Insert
Delete
Clear

The functions for these push buttons are the same as explained in the previous section.

### Size Type

Allows you to specify the type of size data.

*Particle size* allows you to enter the particle diameter as well as the cumulative percent for the sample.

*Sieve size* allows you to enter the percent passed through each specified sieve.

### Distribution Type

Specify the type of data you wish to enter.

---

## Save

---

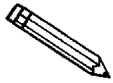
**Save** enables you to save any changes you have made to the file in the active window. The file is saved under its current name.

---

## Save As

---

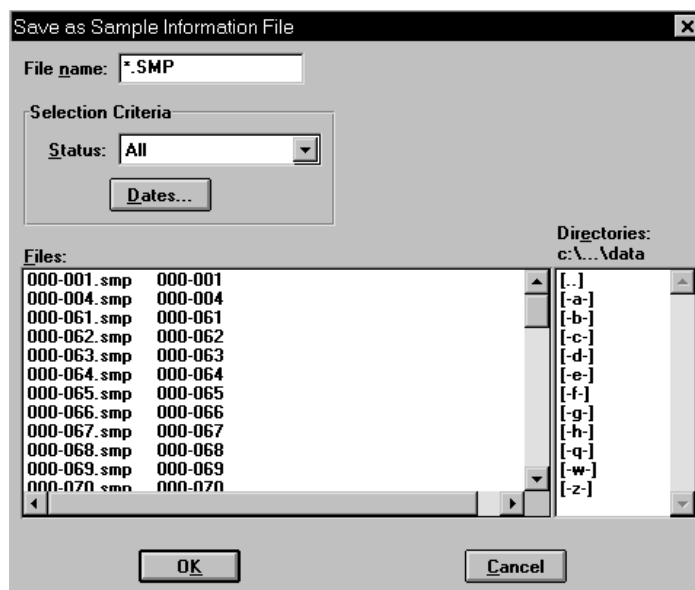
**Save As** enables you to save the sample file or parameter file in the active window under a new name. Saving the file under a new name allows you to make modifications without changing the original file.



**The original file remains open after you save it as a new file. Be sure to open the new file before making any changes.**

You can save a sample information file as another sample information file or any parameter of the file as a parameter file. Parameter files, however, can be saved only as another parameter file of the same type. For example, you can save the respective parameter of the sample information file as an analysis conditions file, material properties file, or a report options file. But an analysis conditions file can 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, Material 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 eight characters for the new file.
- » 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 with the new data.

**Dates**

**Files**

**Directories**

This push button and the contents of these list boxes are explained in **Selecting Files** in Chapter 3.

---

## Save All

---

**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.

---

## Close

---

**Close** enables you to close the file in the active window. You will be prompted to save before closing if the file contains changes that have not been saved.

---

## Close All

---

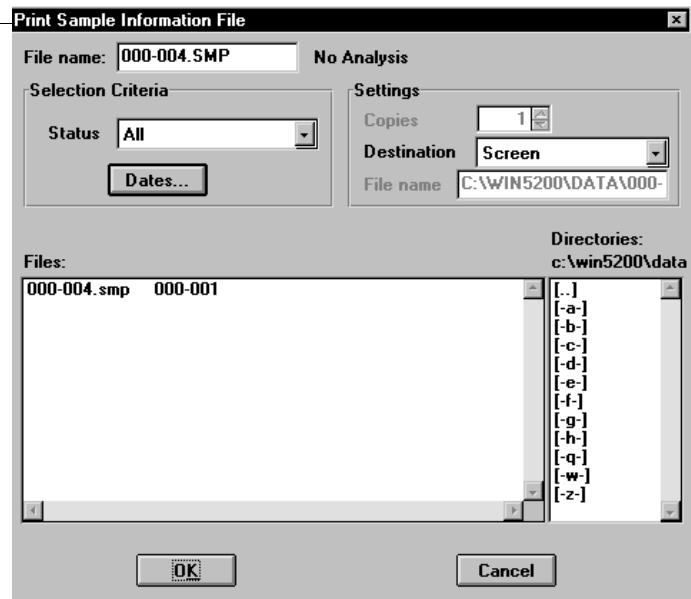
**Close All** enables you to close *all* open files under their current names. You will be prompted to save before closing for each file containing changes that have not been saved..



## 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, Material properties, and Report options. For example, if you choose to print the contents of an analysis conditions file, you will receive the parameters used for all analysis conditions associated with the file. The print dialog is common to all file types. The title bar will display the type of file you are printing.

The title bar displays the type of file you are printing.



### File name

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

Dates

### Files

### Directories

This push button and the contents of these list boxes are explained in **Selecting Files** in Chapter 3.

### Settings group box

Provides print output options.

### Copies

Enabled when *Printer* or *Printer/Plotter* is selected as the print destination. You may print up to four copies.

**Destination**

Contains a drop-down list of available print destinations.

If you select *Screen*, *Printer*, or *Printer/Plotter*, the requested file is sent to that specified destination

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 tool. You also must enter a name in the **File name:** field.

**File name**

Enabled when you select *File* as the destination. A default name is displayed in the field; a new one may be entered if desired.

## List

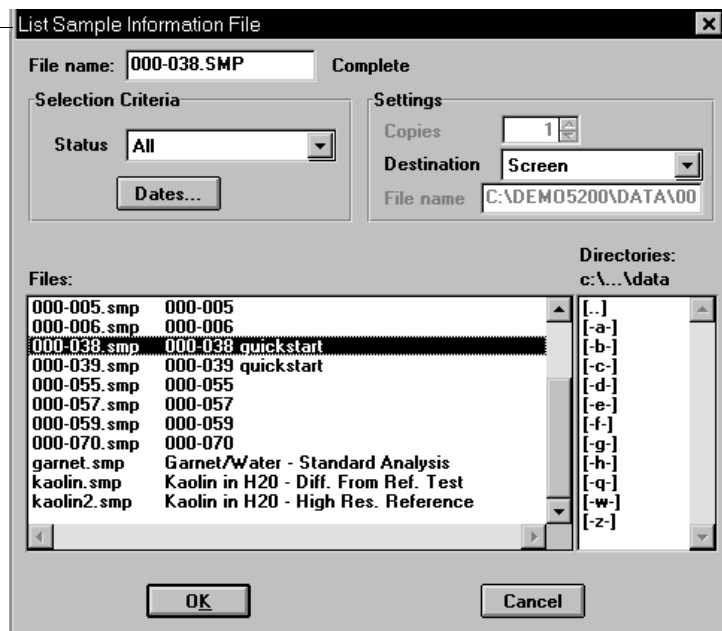
**List** enables you to generate a listing of the following information on a selected file:

- 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, Material properties, and Report options.

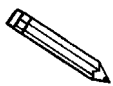
The List dialog is common to all file types. The title bar displays the type of file on which you have requested a list.

The title bar displays the type of file you are generating a list for.



### 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.



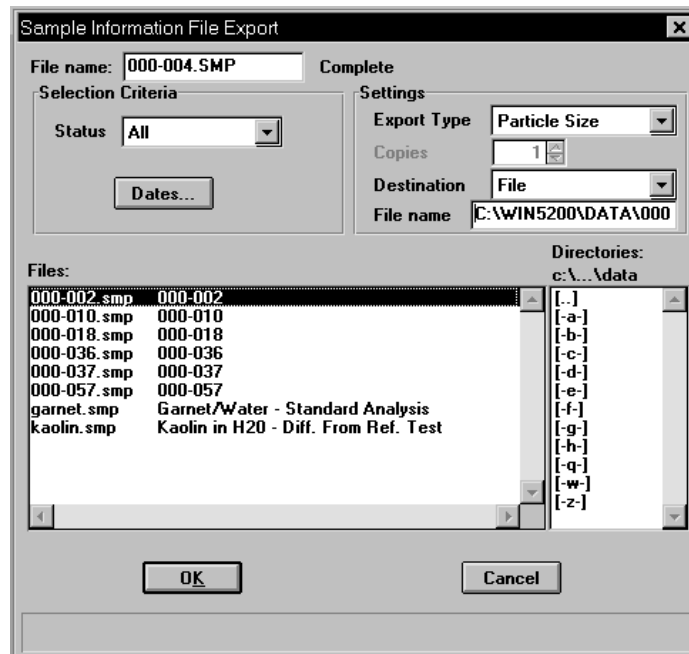
You may request a list on multiple files by holding down **Ctrl** while selecting files. If no files are selected, a list is generated for *all* files.

<b>Dates</b>	
<b>Files</b>	
<b>Directories</b>	This push button and the contents of these list boxes are explained in <b>Selecting Files</b> in Chapter 3.
<b>Settings group box</b>	Provides print output options.
<b>Copies</b>	Enabled when <i>Printer</i> or <i>Printer/Plotter</i> is selected. You may print up to four copies.
<b>Destination</b>	Contains a drop-down list of available print destinations.  <i>Choices: Screen, Printer, Printer/Plotter, File</i>  If you select <i>File</i> , the <b>File name</b> field is enabled.
<b>File name</b>	Enabled when you select <i>File</i> as the destination. A default name is displayed in the field; a new one may be entered if desired.

## Export

**Export** allows you to copy the particle size distribution data or the intensity data in a sample information file and reformat it in ASCII format. The ASCII data can then be imported into other applications (such as spreadsheets) accepting ASCII format. The data are exported in a comma-delimited format. Refer to Appendix H for the exporting format. You may select multiple files by holding down **Ctrl** and clicking the left mouse button once on each file.

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



**File name** Contains the name of the file you select to export.

**Dates**

This push button and the contents of these list boxes are explained in **Selecting Files** in Chapter 3.

**Files**

**Directories**

**Settings group box**

**Export Type**

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

Choose **Particle Size** to generate particle distribution data.

Choose **Intensity** to generate the light intensity vs. scattering angle data, as well as the background.

---

<b>Copies</b>	Enabled when <i>Printer</i> or <i>Printer/Plotter</i> is selected. You may print up to four copies.
<b>Destination</b>	Contains a drop-down list of the available print destinations.  <i>Choices: Screen, Printer, Printer/Plotter, File</i>  If you select <i>File</i> , the <b>File name</b> field is enabled.
<b>File name</b>	Enabled when you select <i>File</i> as the destination. A default name is displayed in the field; a new one may be entered if desired.

---

## Exit

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**Exit** enables you to exit the Saturn DigiSizer analysis program. Even if an analysis is in progress, it will continue until completion; analysis data are collected and stored in the analyzer's memory.

- If a window containing a modified file is open, you are given the opportunity to save the modifications before exiting.
- If deconvolution (calculations) is in progress, the following message is displayed:

**2458- An analyzer is performing a critical operation.  
Wait a few moments before exiting the application.**

You cannot exit the DigiSizer program while a critical operation is in progress. Click  to close the dialog, wait a few minutes, and try again.

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

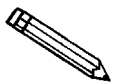
**2459- An analyzer is busy. A delay in restarting this application could result in loss of new data. continue with program exit?**

–**Yes** exits the analysis program

–**No** allows the analysis program to remain active and the analysis to finish



**Although data are stored in the analyzer when you exit the program during analysis, they are not saved in the file until the program is restarted. At that time the data are saved automatically. If a power failure occurs in the interim and you do not have an Uninterruptible Power Supply (UPS) installed, loss of data will result.**



**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.**

If a report is in progress, you are cautioned that reports are being generated, and given the opportunity to either cancel the print job or allow the reports to print before exiting.

# CHAPTER 6

## UNIT MENU

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- Description
- Sample Analysis
- QuickStart
- MasterTech Automatic
- MasterTech Schedule
- Background
- Load from MasterTech
- Rinse
- Drain
- Initialize MasterTech
- Enable Manual Control
- Show Instrument Schematic
- Show Results
- Show Status
- Show Instrument Log
- Unit Configuration
- Service Test

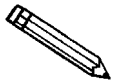




## UNIT MENU

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The Unit menu contains the options for the operations which can be performed with the Saturn DigiSizer. The main menu will contain a Unit menu for each attached analyzer. For example, if you have two attached analyzers, the main menu contains two Unit menus. For convenience and quick recognition, the status displays associated with each unit are displayed in different colors. The unit number and the serial number also are displayed in the title bar of the operational windows. This feature is especially helpful when you have more than one analyzer attached to the same computer.

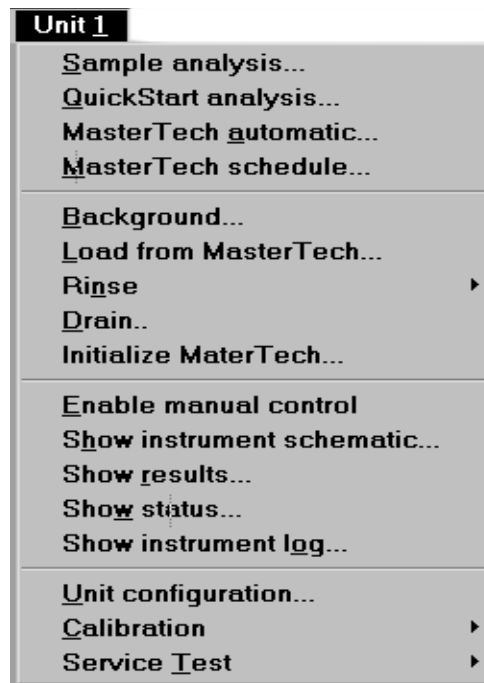


**This menu does not appear on the menu bar if the analysis program is being used for offline data manipulation.**

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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.

### Sample analysis

Use this mode of operation to perform single sample analyses. This option is disabled if analyses are being performed in another mode.

<b>QuickStart analysis</b>	Use this mode of operation to perform successive sample analyses.
<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>Background</b>	Allows you to perform a background measurement.
<b>Load from MasterTech</b>	Allows you to load a sample from the MasterTech into the analyzer.
<b>Rinse</b>	<p>Allows you to perform a rinse operation.</p> <p>Choose <i>DigiSizer</i> to rinse the analysis cell, the reservoir, and the tubing of the DigiSizer.</p> <p>Choose <i>MasterTech</i> to rinse the MasterTech tubing.</p> <p>Choose <i>MasterTech then DigiSizer</i> to rinse both units. The rinse is performed first on the MasterTech then on the DigiSizer.</p>
<b>Drain</b>	Allows you to drain liquid from the Saturn DigiSizer system.
<b>Initialize MasterTech</b>	Allows you to start the MasterTech or realign the MasterTech turntable.
<b>Enable manual control</b>	Allows you to control the system manually.
<b>Show instrument Schematic</b>	Displays a schematic of the analyzer.
<b>Show results</b>	Allows you to have results displayed as data are collected when performing multiple analyses.

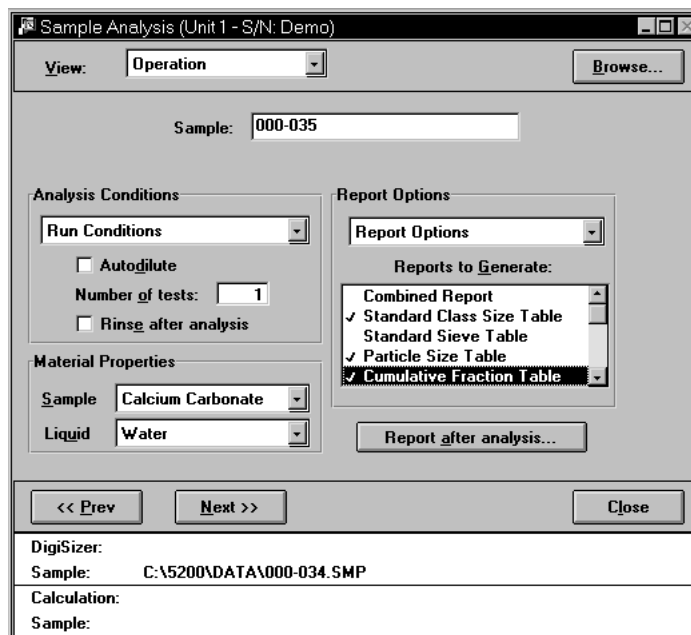
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<b>Show status</b>	Displays the status window of the operation in progress.
<b>Show instrument log</b>	Displays a log of recent analyses, calibrations, and error messages.
<b>Unit configuration</b>	Displays the configuration of the analyzer.
<b>Calibration</b>	Enables you to perform calibration functions. 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 up to eight tests (analyses) on a single sample. When you select this option from the Unit menu, the Sample Analysis dialog is displayed with all fields disabled (greyed out) and the Unit [n] Start Analysis dialog positioned on top. This allows you to select an existing sample file for your analysis or to create a new one.

After a sample file has been designated, the Sample Analysis dialog is displayed. The fields now contain the values for the selected file or, if creating a new file, the specified defaults. Use the Sample Analysis dialog to edit sample parameters.



### View

Allows you to view one of the following in the current window:

- the current operation
- the instrument schematic
- the instrument log
- Two selected report pages from the most recently analyzed sample

Refer to **Show Instrument Log** and **Show Instrument Schematic** later in this chapter for their respective function.

**Browse...**

Displays the Open Sample Information dialog allowing you to select a different sample file for your analysis.

<b>Sample</b>	<p>Contains the description of the current sample file.</p> <p>If this is a new file, this field contains the next sequenced file description based on the format you specified in <b>Sample defaults</b> (Chapter 8).</p> <ul style="list-style-type: none"><li>» You can enter a new description or add to the existing one if desired.</li></ul> <p><i>Range: 50 alphanumeric characters</i></p>
<b>Analysis Conditions</b>	<p>Contains the name of the Analysis Conditions file for the current sample file.</p> <p>If this is a new file, this field contains the Analysis Conditions file you specified as the default.</p> <p>The drop-down list contains a list of predefined parameter files that were included with the analysis program, as well as any that were created and saved to the Parameter files directory (Chapter 8).</p> <ul style="list-style-type: none"><li>» Click on the down arrow to choose a different file.</li><li>» This list is disabled if the file you selected has been used in an analysis.</li></ul>
<b>Autodilute</b>	<p>Allows monitoring of the sample's concentration and adds liquid as needed until the appropriate concentration is attained before analysis and data collection begin.</p>
<b>Number of tests</b>	<p>Enter the number of analyses you wish to perform using this sample file; you can perform up to eight tests with each file.</p>
<b>Rinse</b>	<p>Allows rinsing of the cell, the tubing, and the reservoir after each analysis. We recommend this option remain selected. If you deselect this option and rinses are not performed after analysis, inaccurate results may be obtained on subsequent analyses.</p>

### Material Properties Sample Liquid

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

If this is a new file, these fields display the specified defaults.

- » Click on the down arrow(s) to choose a different Particle (sample) or dispersing liquid.

If your sample material or dispersing liquid is not included in the list, you will have to cancel the current operation and open the sample information file in the Advanced format to add it (see **Material Properties** in Chapter 5).

### Report Options

Contains the name of the Report Options file for the current sample file.

If this is a new file, this field contains the Report Options file you specified as the default.

The drop-down list contains a list of predefined parameter files that were included with the analysis program, as well as any that were created and saved to the Parameter files directory (Chapter 8).

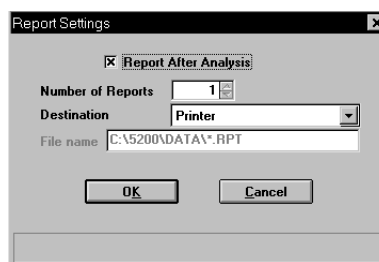
- » Click on the down arrow to choose a different file.

### Reports to Generate

Displays a list of available reports. To select a report: Double-click on the desired report, or highlight the report and press **Spacebar**. Selected reports are preceded with a check mark (✓). Reports are deselected in the same manner.

### Report after analysis

Displays the Report Settings dialog so that you can specify report output requirements.



Select the option presented on this dialog to have reports generated automatically after each analysis.

**Number of Reports** Enter the number of reports you wish to have printed. You can print up to four copies when *Printer* or *Printer/Plotter* is selected as the destination.

**Destination** This drop-down list presents four print destinations: *Screen*, *Printer*, *Printer/Plotter*, *File*

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

**File name** Enabled when *File* is selected as the destination, allowing you to enter a name (or accept the default).

Select **Next>>** on this window to save selections and advance to the next view of the Sample Analysis dialog.

This view of the window shows beam obscuration of the sample as it is being loaded. Add only enough sample to achieve the proper range for your material, using the following guidelines:

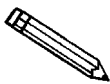
Sample Type	Beam Obscuration
Submicrometer	5% to 10%
1 to 100 micrometers	10% to 20%
100 to 1000 micrometers	20% to 30%



<b>Adjust level to full</b>	Allows you to fill the reservoir with analysis liquid.
<b>Adjust level to primed</b>	Allows you to add enough analysis liquid to reach a primed state.
<b>Adjust level to empty</b>	Empties the reservoir of analysis liquid.

These push buttons are also used to adjust the beam obscuration to the appropriate range for your sample as it is being added to the reservoir:

- If the beam obscuration is too high (indicating low concentration), use **Adjust level to full** or **Adjust level to primed** to add liquid. Do not try to adjust a high obscuration if you have chosen **Autodilute**. The Saturn DigiSizer system will adjust the concentration automatically until the correct beam obscuration is achieved.
- If the beam obscuration is too low (indicating high concentration), continue to add sample. If the reservoir is too full, you can use any of these push buttons to adjust the liquid level to allow room for added sample.



**Refer to Appendix B for additional information on sample dispersion and sample concentration.**

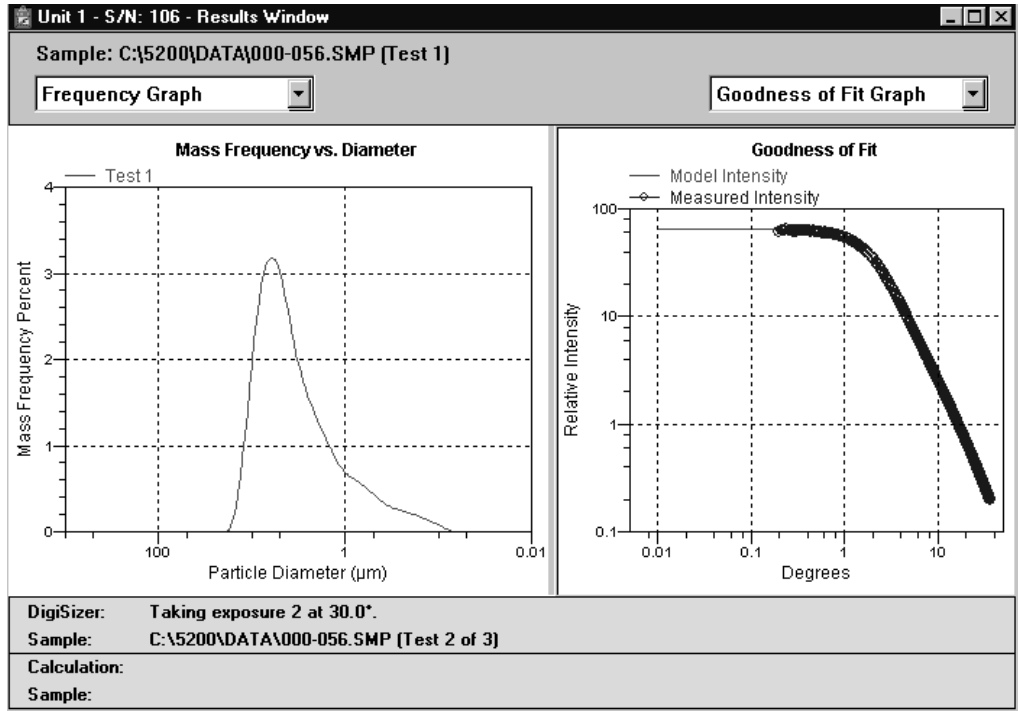
When the concentration is in the recommended range, select **Next>>** to begin data collection. A status view of the Sample Analysis window is then displayed.

This view of the window displays:

- the identification of the sample file
- an estimated time remaining on the analysis
- the current test number
- the current beam angle

A more specific status of the sample is shown in the status area at the bottom of the window. After each test requested of the sample file is complete, data reduction for the test begins; simultaneously, the next test begins.

The next view of the window contains the results of the current test.



The results window contains two panes. Each pane has a drop-down list (positioned just above the pane) containing the report options specified in the sample file.

In these panes, you can:

- **Show results**  
Select a report from the drop-down list to display its results in the pane. Scroll bars are provided in panes where tables are displayed so that you can scroll through the data.
- **Resize the pane**  
Point to the center vertical border (separating the panes); when the cursor turns into a four-way arrow, drag the border in the direction desired.
- **Edit tables and graphs**  
Right-click in the graph (or table) to display a list of editing options. These options are explained in detail in Chapter 7.

## QuickStart

Use this mode of operation to analyze a series of samples of the same type which contain the same analysis conditions. You can request to have sample files created automatically or you can choose a sample file for each sample. When you select this option from the **Unit** menu, the QuickStart dialog is displayed.

### Set liquid level between analyses

Allows you to adjust the liquid level in the reservoir before the sample is loaded.

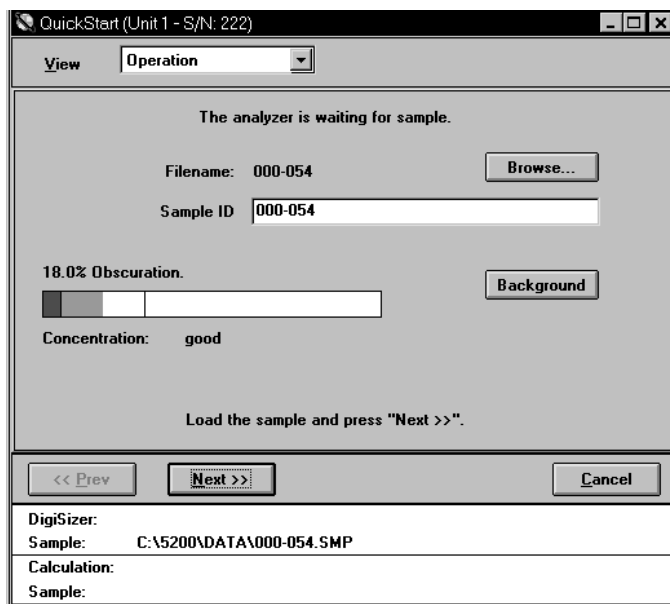
*Choices: No Adjustment; Adjust to full level, Adjust to primed level, Adjust to empty level*

- » *Adjust to full level* fills the reservoir with the dispersing liquid. Choose this level for undispersed, powdered samples; if a maximum amount of liquid is desired; or if bubble problems are anticipated.
- » *Adjust to primed level* fills the reservoir with just enough dispersant to enable circulation. Choose this level for highly concentrated samples.
- » *Adjust to empty level* empties the reservoir of all dispersant, allowing you to pour a previously dispersed sample into the reservoir. Choose this level for samples already at the proper concentration.

<b>Report after analysis</b>	Allows you to have a report(s) generated automatically after each analysis.
<b>Copies</b>	Enter the number of reports you wish to have printed. You can print up to four copies when <i>Printer</i> or <i>Printer/Plotter</i> is selected as the destination.
<b>Destination</b>	This drop-down list presents four print destinations: <i>Screen, Printer, Printer/Plotter, File</i>  If you select <i>File</i> , enter a name in the <b>File name</b> field.
<b>File name</b>	Enabled when <i>File</i> is selected as the destination, allowing you to enter a name (or accept the default).
<b>Sample</b>	Contains the default identification string specified in sample defaults; you can enter a new name if desired. Be sure to include the \$ symbol if you wish to have the sample file number included as part of the description.
<b>File management</b>	Presents two choices for creating file names:  » <i>Prompt for files for each new sample</i> : the analyzer pauses before each analysis so that you can choose a sample file.  » <i>Autodetect each new sample</i> : new files are created sequentially and automatically for each analysis. Numbering sequence is based on the specified default. The description sequence is also based on the default unless you specify a different string in the <b>Sample</b> field on this dialog.  If you use this method, be sure that <b>Rinse after analysis</b> is selected in Sample defaults. Otherwise, the previous sample will not be rinsed from the reservoir; however, the system will detect its presence and analyze it repeatedly.

Select ; a window indicating *Adjusting liquid level* is displayed. You can suspend or skip this procedure by selecting the respective push button. After the liquid has been adjusted, one of two screens is displayed (depending on which file management method you choose):

- If you choose *Prompt for files for each new sample*, this view of the Quick-Start dialog is displayed before *each* analysis.



**Filename:** Displays the next sequenced file number as specified in sample defaults. Click on **Browse...** to select a different file.

**Browse...**

Displays a dialog so that you may select the sample file you wish to use with this analysis. If you do not choose a new file, specified defaults for all parameters will be used.

**Sample ID** Displays the description of the file you choose for the analysis. You can edit the description if desired.

**Background**

Enables you to perform a background before proceeding with analysis. The background is performed using the analysis liquid and the flow rate specified in the sample defaults. When the background has finished, a report is generated (if selected on previous screen) and the current window is again displayed.

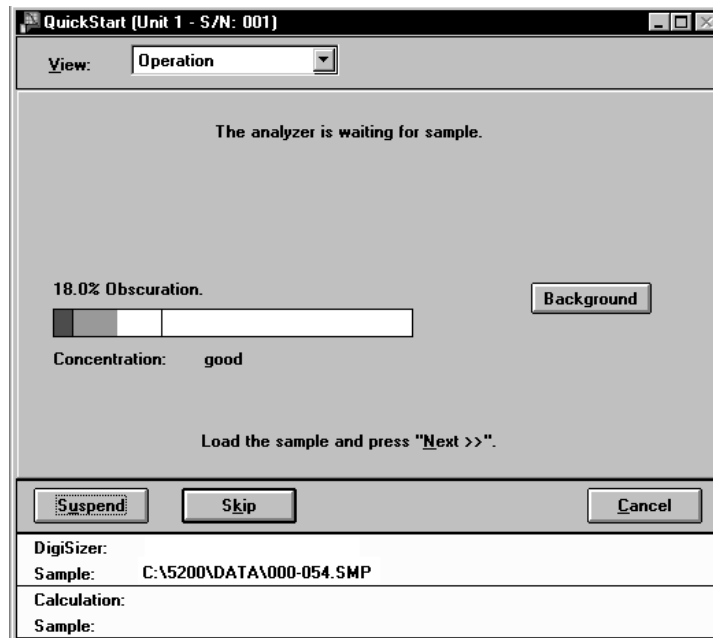
After all selections have been made, begin adding your sample to the reservoir. Observe the beam obscuration of the sample as it is being added. When the concentration is in the recommended range for the type of sample you are analyzing (refer to the following guidelines), select **Next>>** to begin data collection.

Sample Type	Beam Obscuration
Submicrometer	5% to 10%
1 to 100 micrometers	10% to 20%
100 to 1000 micrometers	20% to 30%

The beam obscuration range can also be manually entered using the **Maximum** and **Minimum** fields on the Analysis conditions dialog.

After all analyses have finished, select **Cancel** to close the dialog.

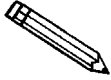
- If you choose *Autodetect each new sample*, this view of the QuickStart dialog is displayed:



After you add your sample to the reservoir, its presence is detected and the remainder of the analysis proceeds automatically. The obscuration must exceed the minimum recommended obscuration on the Analysis conditions window for the analysis to start automatically. If you wish to use a lower obscuration, load the sample and click **Skip** to start the analysis. After the current sample is analyzed, this window is again displayed prompting you to add the next sample.

A **Background** push button is also provided on this dialog, allowing you to perform a background measurement between analyses.

After all analyses have finished, select **Cancel** to close the dialog.



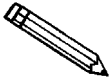
**The status window (described next) is displayed after each analysis is begun regardless of which file management method is chosen.**

A status view of the Sample Analysis window is then displayed. This view of the window displays:

- the identification of the sample file
- an estimated time remaining on the analysis
- the current test number
- the location of the beam angle

A more specific status of the sample is shown in the status area at the bottom of the window. After each test requested of this sample file is complete, data reduction for the test begins; simultaneously, the next test begins. After all tests and rinses (if requested) are finished, the previous window is displayed.

## 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 contains the same analysis conditions; sample files are created automatically. When you select this option from the Unit menu, the MasterTech Automatic Mode dialog is displayed.

### Start with beaker

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

This group box is used to enter resuspension parameters.

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.

» All fields in this group box are disabled if an analysis is in progress.



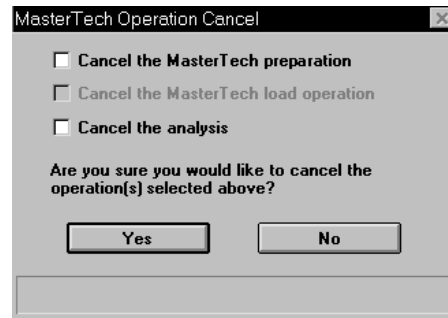
<b>Stirrer time</b>	Enter the number of seconds you wish to have the stirrer operate during resuspension.
<b>Stirrer speed</b>	Choose the stirrer speed.  » Coarse materials and less-stable dispersions may require more high-speed stirring time than finer materials.
<b>Probe time</b>	Enter how long to have the ultrasonic probe operate during resuspension.
<b>Report Settings</b>	This group box is used to designate report output.  » These options are disabled if analyses are in progress.
<b>Report after analysis</b>	Select to have a report generated automatically after each analysis.
<b>Number of Reports</b>	Enter the number of reports you wish to have printed. You can print up to four copies when you select <i>Printer</i> or <i>Printer/Plotter</i> as the destination.
<b>Destination</b>	This drop-down list presents four print destinations:  <i>Screen, Printer, Printer/Plotter, File</i>  If you select <i>File</i> , enter a name in the <b>File name</b> field.
<b>File name</b>	Enabled when <i>File</i> is selected as the destination; enter a name (or accept the default).
<b>Sample</b>	Contains the default identification string specified in sample defaults; you can enter a new name if desired. Be sure to include the \$ symbol if you wish to have the sample file number included as part of the description.  You can also include the beaker number containing the sample in the sample identification by entering the number symbol (#) within the name you specify. For example, <i>Sample in beaker #</i> .

**Start**

Begins the analysis. This push button changes to **Stop** after analysis begins which (if clicked) will stop the analysis.

**Cancel**

Displays a dialog allowing you to choose which operation(s) you wish to cancel. Disabled options indicate that an operation of that type is not in progress and, therefore, cannot be canceled.



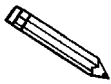
- » *Cancel the MasterTech preparation* cancels the sample currently being prepared by the MasterTech as well as all subsequent samples. It does not cancel any analysis that may be in progress.
- » *Cancel the MasterTech load operation* cancels the loading of the next sample as well as all subsequent samples. It does not cancel any analysis that may be in progress.
- » *Cancel the analysis* cancels the current analysis only; you may continue with other analyses if desired.

**Close**

Closes the dialog. This push button is disabled if an automatic operation is in progress.

This window contains separate status windows for the DigiSizer and the MasterTech. Each status window contains its own **Skip** and **Suspend** push buttons allowing you to perform either or both of these actions on the DigiSizer, the MasterTech, or both. Also displayed just above the status window for the analyzer is the progress of the analysis.

## MasterTech Schedule



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

Use this mode of operation to:

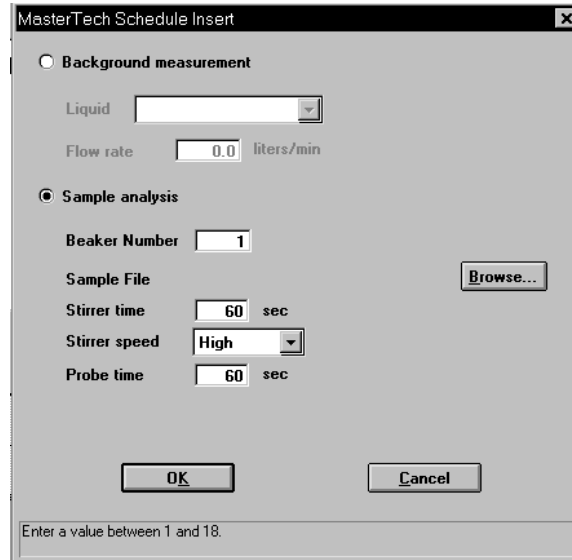
- Analyze a series of samples which may be different in size and shape and, consequently, require different analysis conditions
- Analyze samples and measure a background alternately

When you select this option from the Unit menu, the MasterTech Schedule is displayed.

Beaker Number	Sample File	Stirrer Time	Stirrer Speed	Probe Time	Sample ID
1	000-004	60	High	60	000-004
1	000-028 Background	60	High	60	000-028

**Insert...**

Displays the MasterTech Schedule Insert dialog so that you can select the sample files you wish to use for scheduled analyses.



If you have a sample file selected in the Sample File window, the new file is inserted before the selected file; otherwise it is inserted at the end of the list.

### **Background measurement**

Inserts a background measurement.

- » Select the liquid you wish to use from the **Liquid** drop-down list. Then enter a value in the **Flow rate** field; typically, 6 is sufficient.

### **Sample analysis**

Allows you to schedule a sample analysis.

#### **Beaker number**

Enter the beaker number containing the sample.

#### **Sample file**

Displays the description of the selected sample file.

Select **Browse...** to choose the sample file.

#### **Stirrer time**

Enter the number of seconds to have the stirrer operate during resuspension.

#### **Stirrer speed**

Choose the stirrer speed.

- » Coarse materials and less-stable dispersions may require more high-speed stirring time than finer materials.

**Sample analysis***(continued)***Edit...****Probe time**

Enter how long you wish to have the ultrasonic probe operate during resuspension.

- » Coarse materials and less-stable dispersions may require more stirring time than finer materials.

Displays the MasterTech Schedule Edit dialog so that you can edit the sample file or dispersion conditions.

- » This dialog is identical to the MasterTech Schedule Insert dialog box explained previously.

**Delete**

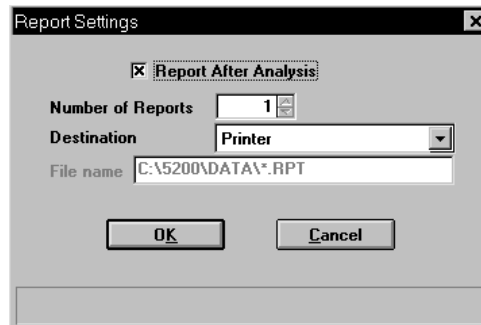
Removes the selected item from the list. This push button is disabled if nothing is selected.

**Clear**

Removes all of the files listed in the window. The files do not have to be selected.

**Report Settings...**

Allows you to choose report output options. When you click on this push button, the Report Settings dialog is displayed.

**Report After Analysis**

Select to have a report generated automatically after each analysis.

**Number of Reports**

Enter the number of reports you wish to have printed. You can print up to four copies when you select *Printer* or *Printer/Plotter* as the destination.

**Destination**

This drop-down list presents four print destinations:

*Screen, Printer, Printer/Plotter, File*

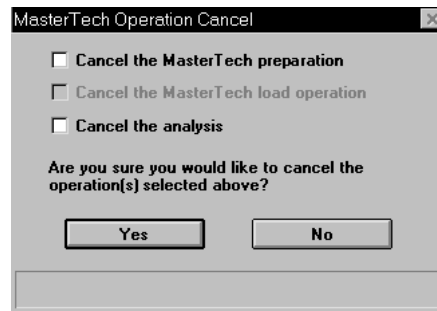
If you select *File*, enter a name in the **File name** field.

**File name**

Enabled when *File* is selected as the destination; enter a name (or accept the default).

**Cancel**

Displays a dialog allowing you to choose which operation(s) you wish to cancel. Disabled options indicate that an operation of that type is not in progress and, therefore, cannot be canceled.



- » *Cancel the MasterTech preparation* cancels the sample currently being prepared by the MasterTech as well as all subsequent samples. It does not cancel any analysis that may be in progress.
- » *Cancel the MasterTech load operation* cancels the loading of the next sample as well as all subsequent samples. It does not cancel any analysis that may be in progress.
- » *Cancel the analysis* cancels the current analysis only; other scheduled operations will continue.

**Close**

Closes the dialog. This push button is disabled if an automatic operation is in progress.

This window contains separate status windows for the DigiSizer and the MasterTech. Each window contains its own **Skip** and **Suspend** push buttons allowing you to perform either or both of these actions on the DigiSizer, the MasterTech, or both. Also displayed just above the status window for the analyzer is the progress of the analysis.

## Background

Before you can perform an analysis, you must have a background measurement for data collection. It is not necessary to measure a background for each analysis. Micromeritics recommends that you perform a background measurement at the change of each shift or if you change dispersing agents. You may perform up to eight measurements; however, you can save and use only the last one. Refer to Appendix J for a discussion and illustrations on background quality.

When you select **Background** from the Unit menu, the Background Measurement dialog is displayed.

Background Measurement (Unit 1 - S/N: Demo)

Current background data

Analysis Liquid	Refractive Index	Date	Time
Water	1.330	1/15/00	9:51:34AM

Analysis liquid:

- Water
- Isopropanol
- 1-Butanol
- Ethanol
- Methanol
- Glycerol
- Octane

Add

Delete

Description: Water

Refractive Index: 1.330

Viscosity: 0.890 cp

Density: 1.000 g/cm<sup>3</sup>

<< Prev    Next >>    Cancel

DigiSizer:

### Current background data

Displays the following information for the last background measured for this unit:

- the analysis liquid and its refractive index
- the date and time of the last background

### Analysis liquid

Displays a list of analysis liquids. Select the liquid you wish to use for the measurement; its properties are displayed automatically in the fields to the right of the list. You can also add new liquids to the list using the **Add** push button (described below).

### Description

Displays the name of the selected analysis liquid. This field is also used to add new liquids to the list.

### Refractive Index Viscosity Density

Display the properties of the selected analysis liquid. These fields are also used to enter properties of an analysis liquid that you wish to add to the list.

- Add** Adds a new analysis liquid to the list.
- » Enter the name of the liquid you wish to add in the **Description** field, its properties in the **Refractive Index**, **Viscosity**, and **Density** fields; then click **Add**.
- Delete** Deletes the selected analysis liquid from the list.

Select **Next>>** on this dialog to display the next window for the Background Measurement. This view allows you to enter the flow rate for the measurement and specify report output options.

- Analysis Liquid** Displays the liquid being used for the background measurement.
- Set flow rate** Select to enter the flow rate; typically, 6 liters per minute is sufficient.
- Flow rate** Enter the desired flow rate; disabled if **Set flow rate** is not selected.
- Report after measurement** Select to have a report generated automatically after each measurement.
- Number of reports** Enter the number of reports you wish to have printed. You can print up to four copies when you select *Printer* or *Printer/Plotter* as the destination.



**Destination** This drop-down list presents four print destinations:

*Screen, Printer, Printer/Plotter, File*

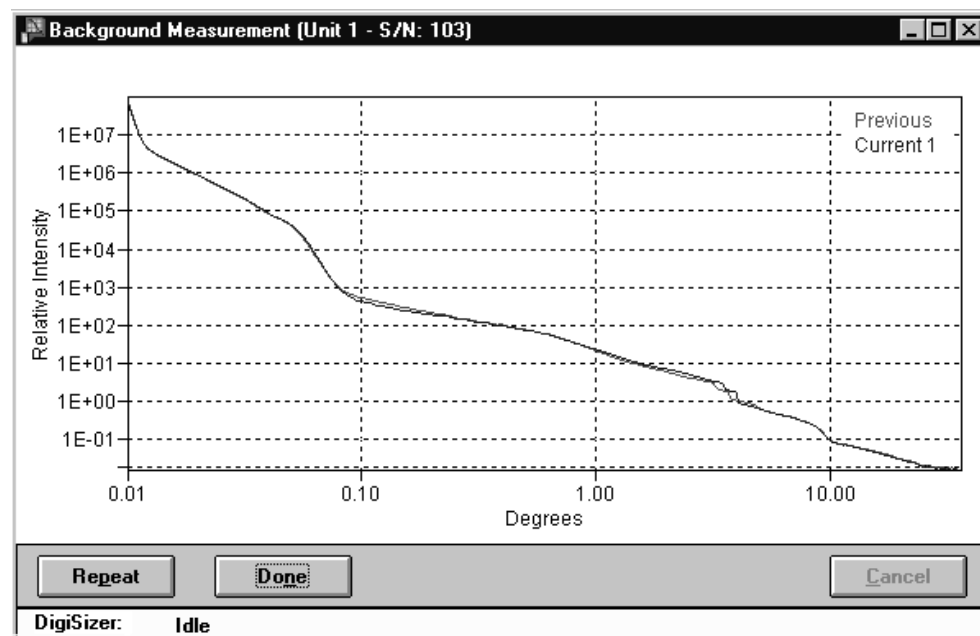
Graphical data cannot be generated to a File. If you wish to have a printout of the background graph, print to the screen and then copy as a metafile.

**File name** Not applicable to background measurements.

Click **Next>>** to begin the background measurement; a status view of the Background Measurement window is then displayed. This view of the window displays:

- the analysis liquid being used for the background measurement
- an estimated time remaining on the measurement
- the current beam angle

The status window at the bottom of the dialog shows a more specific status. After the background measurement is finished, the completed background measurement is displayed.



**Repeat**

Select to perform another measurement. This push button becomes disabled after eight measurements. Refer to Appendix J for information on determining a suitable background.

**Done**

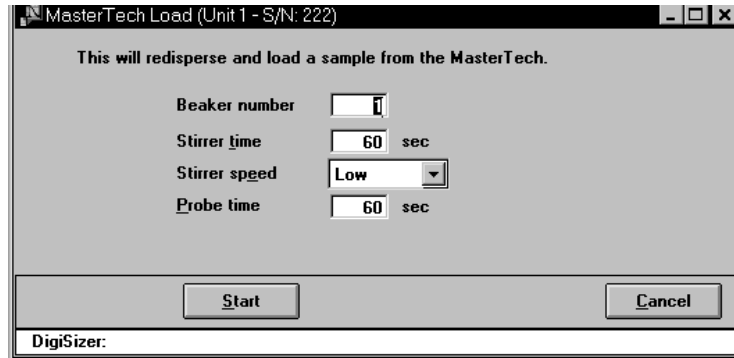
Saves the last measured background and closes the dialog.

---

## Load from MasterTech

---

This option allows you to manually redisperse a sample then transfer it to the DigiSizer for analysis. The MasterTech Load dialog is displayed.

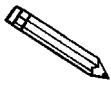


- |                      |  |
|----------------------|--|
| <b>Beaker number</b> | Enter the position number of the beaker containing the sample you wish to load.<br><br><i>Range: 1 to 18</i>   |
| <b>Stirrer time</b>  | Enter the number of seconds to have the stirrer operate during resuspension.   |
| <b>Stirrer speed</b> | Choose the stirrer speed.<br><br>» Coarse materials and less-stable dispersions may require more high-speed stirring time than finer materials.  |
| <b>Probe time</b>    | Enter how long you wish to have the ultrasonic probe operate during resuspension.<br><br>» Coarse materials and less-stable dispersions may require more stirring time than finer materials. |
| <b>Start</b>         | Begins the load operation; a message is displayed indicating a load operation is in progress. After the sample has been loaded, the dialog closes.   |
| <b>Cancel</b>        | Cancels the load operation and closes the dialog.  |

---

## Rinse

---



**This option is disabled if analyses are in progress.**

A rinse operation should be performed to rinse away any contaminants from the analysis cell, reservoir, and tubing which may have remained from a previous analysis.

When you select **Rinse** from the Unit menu, three choices are available:

- **DigiSizer** - rinses the analysis cell, reservoir, and tubing of the DigiSizer.
- **MasterTech** - rinses the MasterTech tubing. Disabled if a MasterTech is not connected to the DigiSizer.
- **MasterTech Then DigiSizer** - rinses the MasterTech tubing, then the analysis cell, reservoir, and tubing of the DigiSizer. Disabled if a MasterTech is not connected to the DigiSizer.

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## DigiSizer

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### Rinse Cycles

Select **Autorinse** to have the system determine how many rinses to perform in order to reach a beam obscuration of 0.1 or less.

**If your analysis and rinse liquids are the same,** rinsing stops when:

- No significant decrease in beam obscuration is attained twice in a row, displaying an error message. (Appendix A lists actions for the displayed error message.)

## Rinse cycles

(continued)

- The system has performed 10 rinses and was unable to attain 0.1 or less; an error message is displayed. (Appendix A lists actions for the displayed error message.)

**If your analysis and rinse liquids are different,** rinsing stops when:

- Successive rinses show no significant decrease in beam obscuration. If the beam obscuration is greater than 1.0, an error message is displayed. (Appendix A lists actions for the displayed error message.) If the beam obscuration is less than 1.0, it is assumed to be due to the difference in liquids and operation continues.
- The system has performed 10 rinses and was unable to attain a beam obscuration of less than 0.1, displaying an error message. (Appendix A lists actions for the displayed error message.)

Select **Rinses** to specify an exact number of rinses to perform.

Start

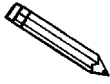
Begins the rinse operation; a message is displayed indicating a rinse operation is in progress. When rinsing is complete, the dialog closes.

Cancel

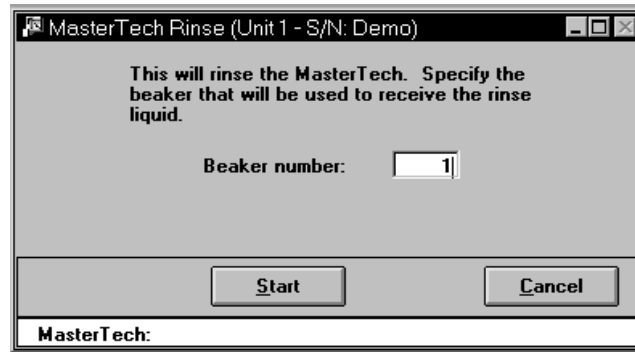
Cancels the rinse operation and closes the dialog.

## MasterTech

---



This option is available only if you have a MasterTech connected to your analyzer and analyses are not in progress.



### Beaker number

Enter the position number of the beaker you wish to rinse into. Be sure the beaker contains a small amount (approximately 10 mL) of liquid; otherwise, its presence may not be detected by the MasterTech.

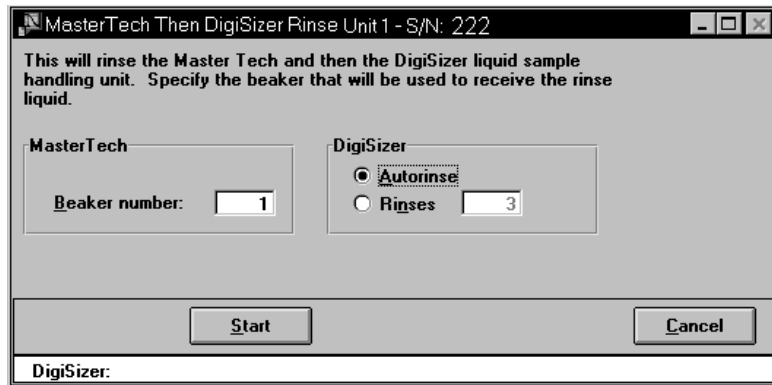
*Range: 1 to 18*

### Start

Begins the rinse operation; a message is displayed indicating a rinse operation is in progress. When rinsing is complete, the dialog closes.

## MasterTech Then DigiSizer

Select **MasterTech then DigiSizer**; the MasterTech Then DigiSizer Rinse dialog is displayed.



### MasterTech Group Box

Enter the position number of the beaker you wish to rinse into. Be sure the beaker contains a small amount (approximately 10 mL) of liquid; otherwise, its presence may not be detected by the MasterTech.

### DigiSizer Group Box

Select **Autorinse** to have the system determine how many rinses to perform in order to reach a beam obscuration of 0.1 or less.

**If your analysis and rinse liquids are the same,** rinsing stops when:

- No significant decrease in beam obscuration is attained twice in a row, displaying an error message. (Appendix A lists actions for the displayed error message.)
- The system has performed 10 rinses and was unable to attain 0.1 or less; an error message is displayed. (Appendix A lists actions for the displayed error message.)

**DigiSizer  
Group Box***(continued)*

If your analysis and rinse liquids are different, rinsing stops when:

- Successive rinses show no significant decrease in beam obscuration. If the beam obscuration is greater than 1.0, an error message is displayed. (Appendix A lists actions for the displayed error message.) If the beam obscuration is less than 1.0, it is assumed to be due to the difference in liquids and operation continues.
- The system has performed 10 rinses and was unable to attain a beam obscuration of less than 0.1, displaying an error message. (Appendix A lists actions for the displayed error message.)

Select **Rinses** to specify an exact number of rinses to perform.

**Start**

Begins the rinse operation; a message is displayed indicating a rinse operation is in progress. When rinsing is complete, the dialog box closes.

**Cancel**

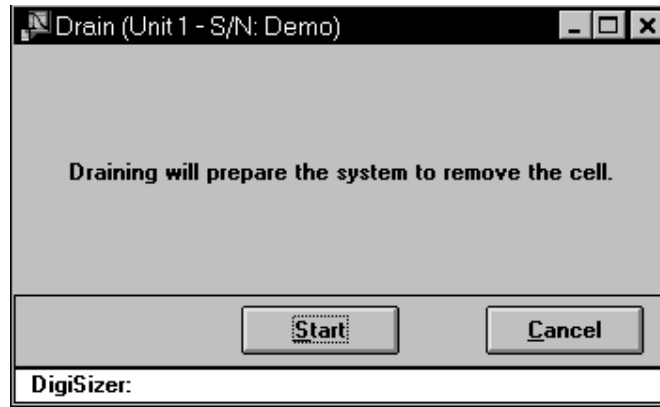
Cancel the rinse operation and closes the dialog box.

---

## Drain

---

Select this option to drain the Saturn DigiSizer system of all liquid. This operation must be performed before the sample cell can be removed; otherwise, the sample compartment will be flooded with liquid. This operation also moves the rotation arm out of the way so that the sample cell is accessed easily.



Begins the draining process; when all liquid has been drained from the system, the dialog closes automatically.

---

## Initialize MasterTech

---

Select this option to align the MasterTech tray or if you wish to perform manual operations with the MasterTech. When the MasterTech is initialized, the tray is aligned so that beaker #1 is in the starting position.

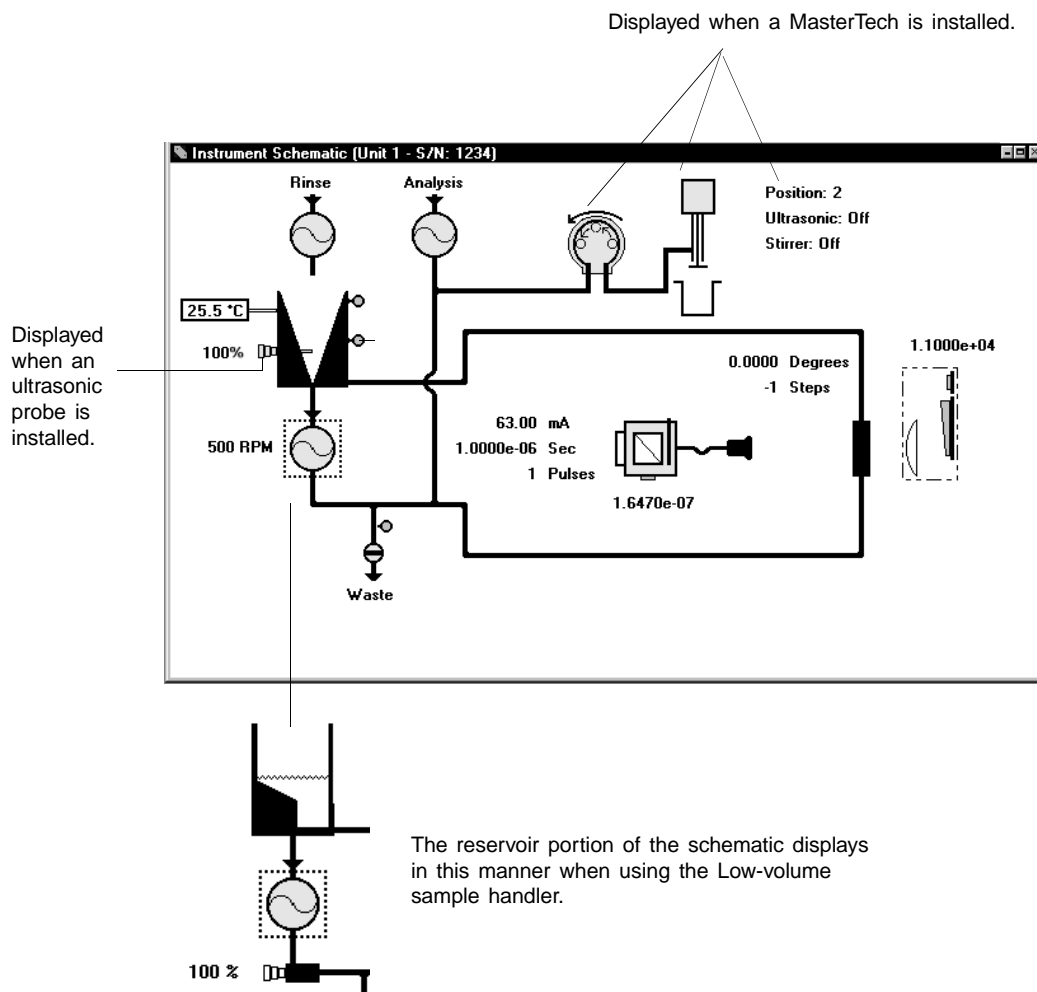


Begins initialization; when initialization is complete, the dialog closes automatically.



## Enable Manual Control

Select this option to control your system manually. If the instrument schematic is not displayed, select **Show Instrument Schematic**. This illustration shows a schematic of the DigiSizer with the standard liquid sample handler installed.



When you enable manual control, the symbols for valves and pumps change color on the screen to indicate manual operation.

- Valves:    Closed = Yellow            Open = Green
- Pumps:    Off = Yellow                    On = Green\*

\*The analysis pump displays as light green when operating at high speed, and dark green when operating at low speed.

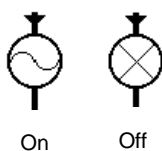
Use the mouse pointer or **Tab** to select schematic components. A component is selected when it is surrounded by a dotted line.

Each component has a pop-up menu displaying the operations available for that particular component. These menus may be accessed by right-clicking on the desired component, or by using the shortcut keys, **Shift** **F9** .

You can turn pumps on and off, as well as open and close valves by using one of the following methods:

- access the pop-up menu and select the appropriate action
- double-click on the pump (or valve) symbol
- select the pump (or valve) symbol and press the spacebar

### Circulating pump

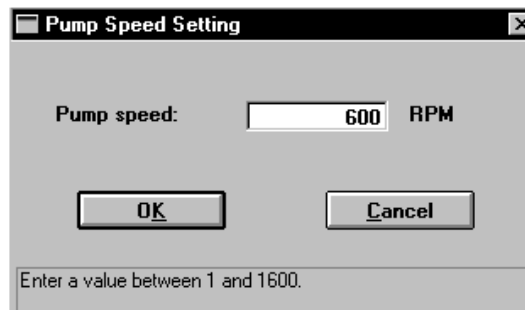


Pumps the sample and dispersing liquid through the analysis system. The direction of the flow of liquid is fixed as indicated by the arrow just above the pump.

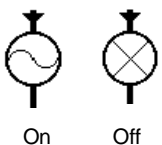
*Colors:*    *Green = On*  
                   *Yellow = Off*

*Actions:*    *On, Off, Set speed*

The speed at which the pump is operating is displayed to the left of the pump symbol. To specify a different speed, select *Set speed*; the Pump Speed Setting dialog is displayed:



### Rinse pump



Pumps the rinse liquid into the reservoir. The direction flow of the liquid is fixed as indicated by the arrow just above the pump.

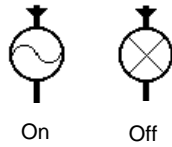
*Colors:*    *Green = On*  
                   *Yellow = Off*

*Actions:*    *On, Off*

If your DigiSizer has the Low-volume liquid sample handler installed, the rinse pump does not display. The Low-volume liquid sample handler uses the analysis liquid for the rinsing operation.

**Analysis liquid pump**

Pumps analysis liquid into the reservoir.

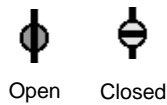


*Colors:* Green (light) = On at high speed  
 Green (dark) = On at low speed  
 Yellow = Off

*Actions:* High, Low, Off

**Waste Valve**

When open, allows the sample and analysis liquid to be flushed from the system.



*Colors:* Green = Open  
 Yellow = Closed

*Actions:* Open, Close

**Liquid level sensor**

Detects the liquid level of the associated component. Two sensors are located on the reservoir, one for the primed level and one for the full level. One sensor is located on the Waste valve.

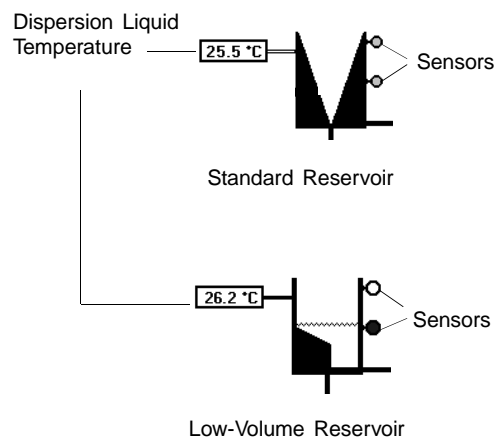


*Colors:* Blue = Liquid sensed  
 Gray = No liquid sensed

*Actions:* None available; display component only

**Reservoir**

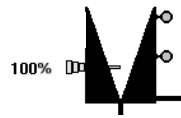
Holds the dispersed sample.



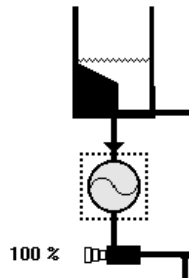
The temperature of the dispersion liquid is displayed to the left of the reservoir.

The reservoir has two liquid level sensors; one for the primed level and one for the full level.

**Ultrasonic Probe**



The probe is displayed in this position when using the standard sample handler.



The probe is displayed in this position when using the low-volume sample handler.

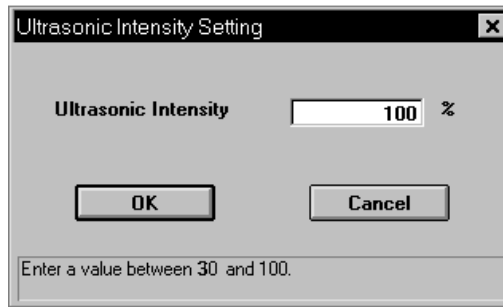
Typically, an optional ultrasonic probe is installed to maintain sample dispersion. The percentage of power being generated is shown to the left of the probe.

*Colors: Green = On  
Yellow = Off*

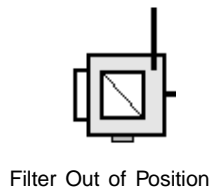
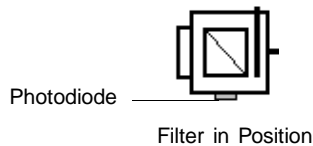
*Actions: Probe on, Probe off, Set probe intensity*

Colors are not displayed and actions are unavailable if an ultrasonic probe is not installed.

Select *Set probe intensity* to edit the ultrasonic power; the Ultrasonic Intensity Setting dialog is displayed.



**Laser assembly**



The exposure parameters, drive current, pulse time, and number of pulses are displayed to the left of the laser assembly. The light dose for the photodiode is shown directly below the photodiode.

*Colors: **Laser Assembly**  
Yellow = Manual control enabled  
Green = Exposure in process  
Red = Laser is on*

**Photodiode**  
*Grey = Idle  
Blue = Exposure in process*

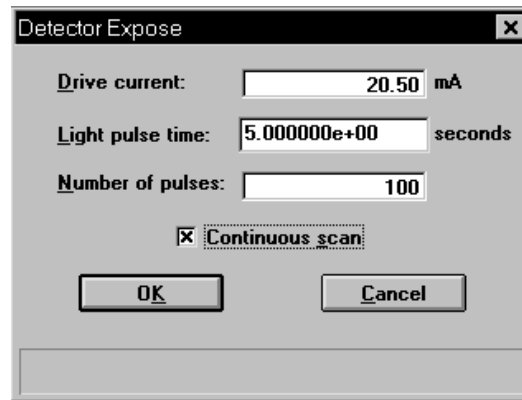
*Actions: Filter in, Filter out, Expose, Stop exposure, Display*

## Laser assembly (continued)

Error conditions associated with the laser assembly are displayed on the schematic in red with yellow text. Appendix A provides causes and actions for these error messages.

The filter controls the light coming from the laser. Select *Filter in* to have the laser intensity absorbed by a factor of approximately 10,000.

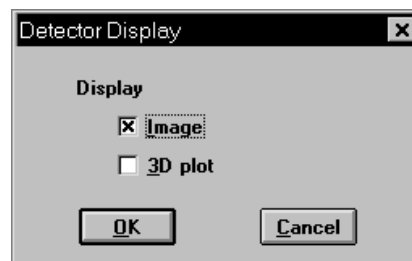
Select *Expose* to specify detector exposure values; the Detector Expose dialog is displayed.



*Continuous scan* allows successive exposures to be taken using the same conditions.

*Stop exposure* stops the continuous scan as well as any exposure that may be in progress.

*Display* displays the Detector Display dialog allowing you to select a format in which to view an image of the raw data.



Choose *Image* to view the data in a bitmap format and *3D plot* to view the data in a 3-dimensional format. If you choose both options, two windows are opened. After you select  , a Display window is shown. All subsequent exposures will be shown in the windows.

## Laser assembly (continued)

Each time an exposure is taken, it is displayed in the window as long as the window remains open. This window contains four push buttons:

**Snap**

Makes a duplicate copy of the entire window and its contents. The duplicate copy does not contain a **Snap** push button and does not get updated with future images.

**Print**

Prints the contents of the window to the specified printer.

**Copy**

Copies the contents of the window to the clipboard.

**Save as...**

Saves the image to an IMG file for future retrieval.

**Load...**

Loads a previously saved image (IMG file) into the window.

**Close**

Closes the display window.

## Rotation arm

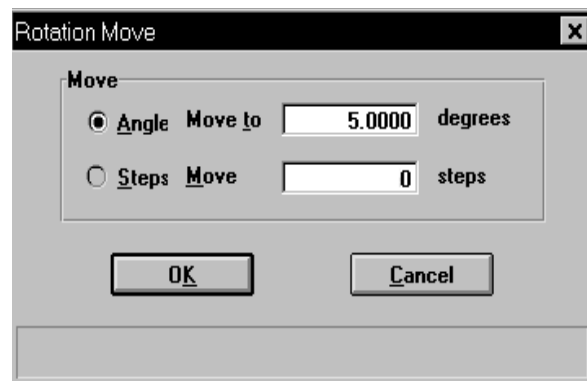


The arm position is displayed in degrees and steps above the component image.

*Colors: None*

*Actions: Move, Set reference angle*

Select *Move* to change the arm position; the Rotation Move dialog is displayed.



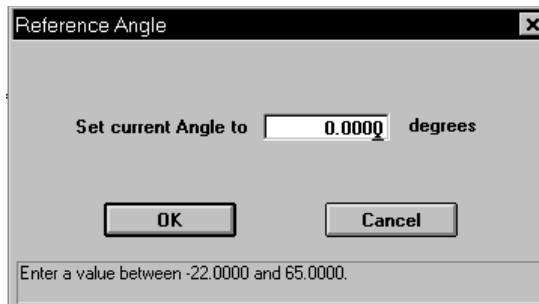
**Rotation arm**

(continued)

*Angle move to* moves the arm to the specified beam angle.

*Steps move* moves the arm the specified number of steps from the current position. There are approximately 78,507 steps per degree.

Select *Set reference angle* to specify the current position of the rotation arm; the Reference Angle dialog is displayed.



**CCD and beam photodiode**



The light dose of the last exposure is displayed directly above the component image.

*Colors:* Grey = No exposure in process  
Blue = Exposure in process

*Actions:* None available; display component only

Error messages are displayed in red with yellow text. Refer to Appendix A for causes and actions.

**MasterTech pump**



Load



Rinse

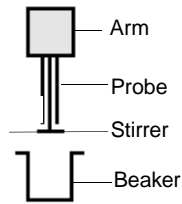
Displayed only when a MasterTech is installed. Flow direction is indicated by the direction of the arrows between the rollers and the one above the pump.

*Colors:* Green = On  
Yellow = Off

*Actions:* On, Off, Flow direction rinse, Flow direction load

*Flow direction rinse* pumps the rinse liquid to the MasterTech to rinse the MasterTech tubing of any sample which may have remained from a previous analysis.

*Flow direction load* sends the sample to the Saturn DigiSizer analyzer for analysis.

**MasterTech arm**

Displayed when a beaker is in position.

*Colors:*

**Arm**

*Yellow = manual control enabled*

**Probe**

*Green = On*

*Black = Off*

**Stirrer**

*Black = Off*

*Green = On, low speed*

*Blue = On, high speed*

*Actions:*

*Move arm up, Move arm down*

*Ultrasonic on, Ultrasonic off*

*Stirrer on, Stirrer off*

*Stirrer speed fast, Stirrer speed slow*

*Move to beaker*

*Initialize*

*Self Test*

*Move to beaker* allows you to specify the position of the beaker to which you wish to move the arm.

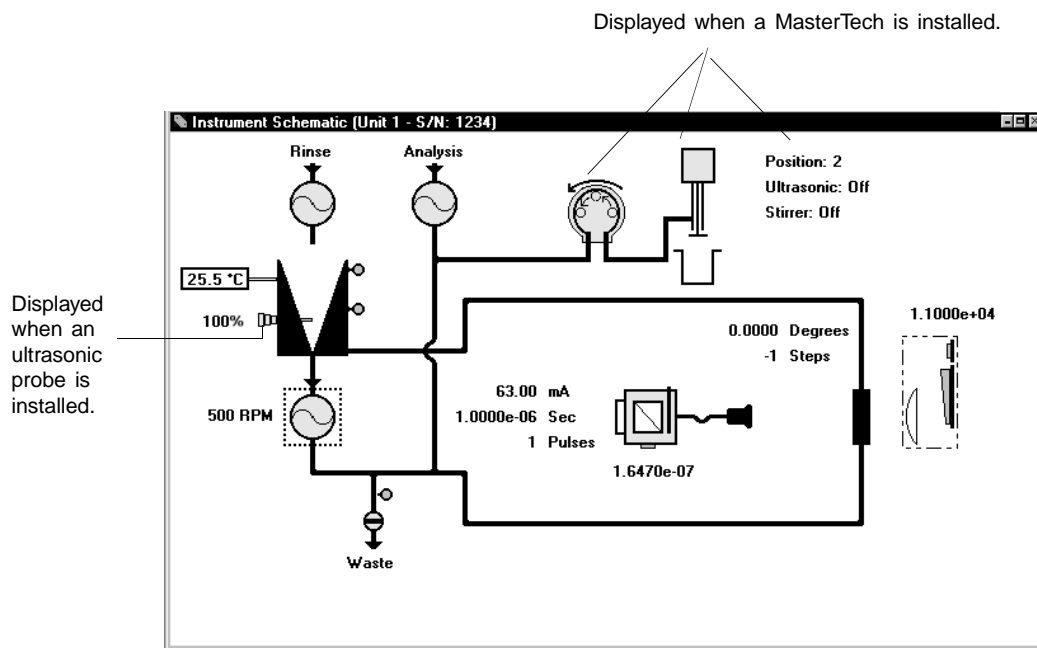
*Initialize* aligns the MasterTech tray so that Beaker #1 is in the starting position.

*Self Test* verifies that all components of the MasterTech are working properly.

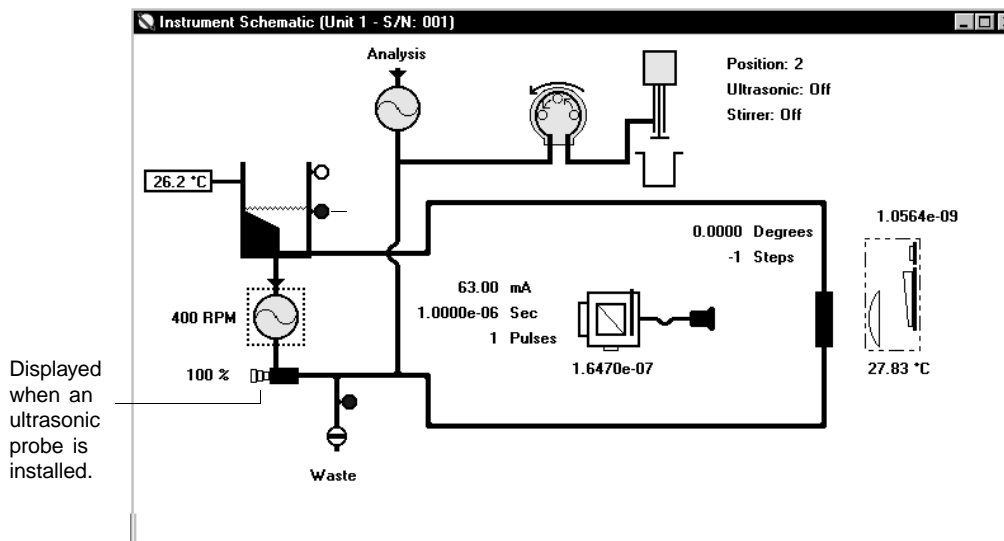


## Show Instrument Schematic

Select this option to display a schematic of the Saturn DigiSizer. Refer to the previous section for an explanation of the components displayed on the instrument schematic.



*Schematic of Saturn DigiSizer with the Standard liquid sample handler installed.*



*Schematic of Saturn DigiSizer with the Low-volume liquid sample handler installed.*

Even if manual control is not enabled, you still can determine the state of the valves and pumps by color.

- Valves:    Closed = White            Open = Green
- Pumps:    Off = White                        On = Green

If you wish to change the state of a valve or pump, you must enable manual control.

---

## Show Results

---

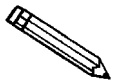
Choose this option to have results displayed as data are collected for multiple analyses.

---

## Show Status

---

A status window is shown across the bottom of all operational dialogs. The Show Status option enables you to show only the status window of the operational dialog. If you have a MasterTech installed, its status is also included.



**If you have two instruments attached to your computer, the status bar for each instrument is displayed in a different color.**

Displays when a MasterTech is attached to the analyzer.

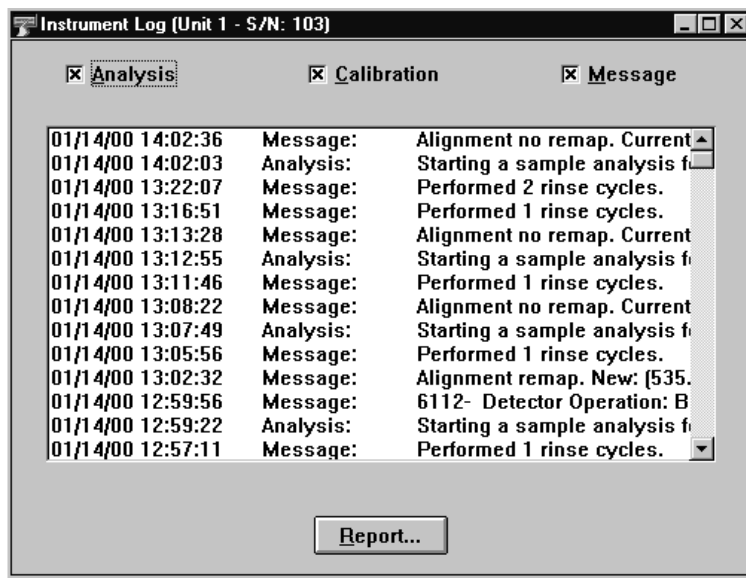
Status (Unit 1 - S/N: 106)	
DigiSizer:	Rotating to angle -19.1°
Sample:	C:\5200\DATA\000-056.SMP (Test 1 of 3)
Calculation:	Calculation iteration 81
Sample:	C:\5200\DATA\000-056.SMP (Test 4)
<b>MasterTech:</b>	
<b>Sample:</b>	

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 monitor 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 all units displayed at one time.

## Show Instrument Log

Displays 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 WIN5200.INI file.



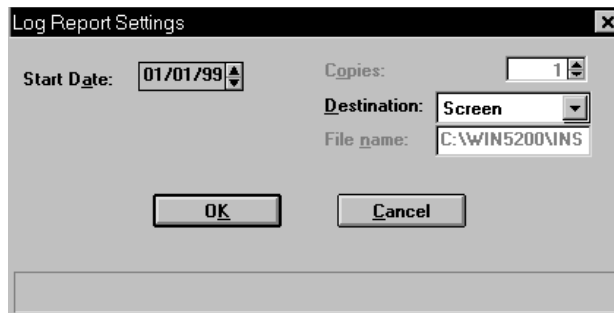
You can choose what you wish to display in the window by selecting only the desired item(s). For example, select only the Calibration check box to display only calibration information.

**Analysis**  
**Calibration**  
**Messages**

These options allow you to choose which entries are displayed in the window.

**Report...**

Allows you to generate the log contents to a specified destination; the Log Report Settings dialog is displayed.



**Report...**

(continued)

Use the **Start Date** field to specify the date at which to start the printout. You can specify a date using one of the following methods:

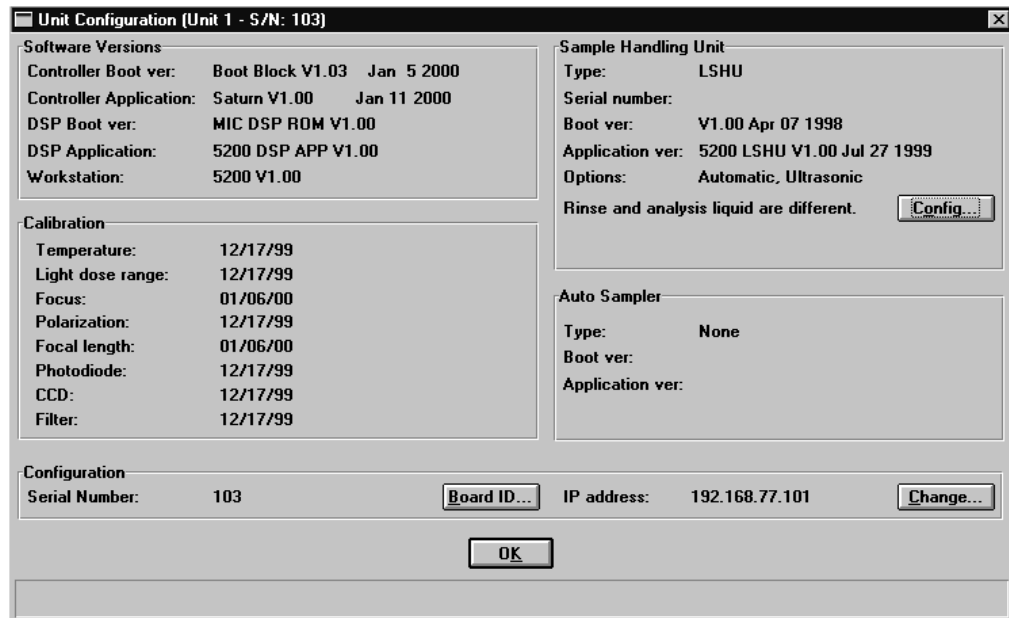
- Highlight the field (or press **F2** to clear the field) and type in the desired date.
- Double-click in the field (or press **F4**) to display a calendar to choose a date.
- Press **F2** to clear the field, then **F3** to insert the current date.

Enter the number of copies desired in the **Copies** field; you may print up to 4. This field is disabled if you are printing to a *File* or to the *Screen*.

Choose the report destination from the drop-down list in the **Destination** field. If you choose *File*, the **File name** field is enabled, allowing you to enter a name for the printed file (or you may accept the default).

## Unit Configuration

Select this option to display the software/hardware configurations for the Saturn DigiSizer system. When you select Unit Configuration from the Unit menu, the Unit Configuration dialog is displayed.



### Software Versions

Displays the software versions being used by the analyzer.

### Calibration

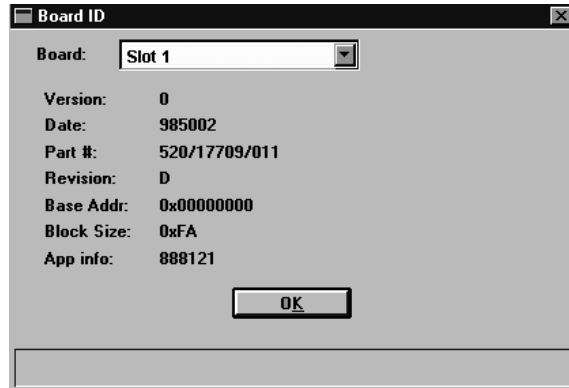
Displays calibration dates.

### Configuration

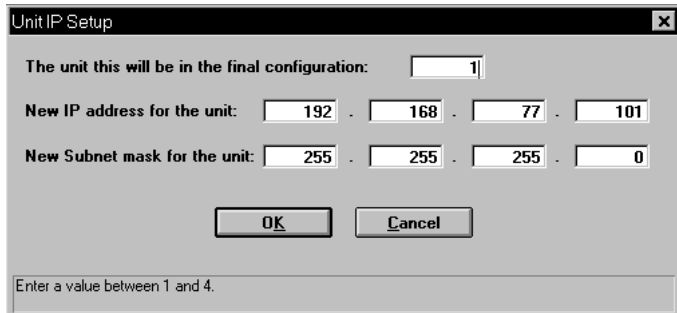
Displays the analyzer's serial number and the IP address.

**Board ID**

Displays the Board ID dialog so that you can view the statistics of the board contained in the requested slot of the computer.

**Change**

Displays the Unit IP Setup dialog, allowing you to specify IP addresses for multiple analyzers to be used with the same computer



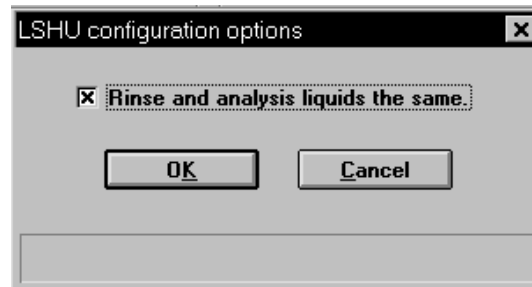
Refer to Appendix I for instructions on installing multiple analyzers.

**Sample Handling Unit**

Displays the type of sampling unit being used, its serial number, software versions, and installed options. This group box also lets you know if your analysis liquid and dispersing liquid are the same or different.

**Config**

Displays the LSHU configuration options dialog so that you can specify whether the rinse and analysis liquids are to be the same or different.

**Auto Sampler**

Displays the type of autosampler being used (if any) and its software versions.

---

## Service Test

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Various service tests are included in the Saturn DigiSizer operating program. These tests can be enabled and 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.

## CHAPTER 7

### REPORTS MENU

---

- Description
- Start Report
- Close Reports
- Background
- SPC Report Options
- Regression Report
- Control Chart
- PSD History
- Printed Reports
- Report Examples





## REPORTS MENU

---

The Reports menu contains options which allow you to initiate and close reports for:

- Sample analyses
- Background information
- Statistical process control
- Historical particle size distribution

This chapter describes the options contained on the Reports menu, the type of reports available, and sample copies of generated reports.

---

### Description

---



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 window(s).
<b>Background</b>	Initiates a report on the current background 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.

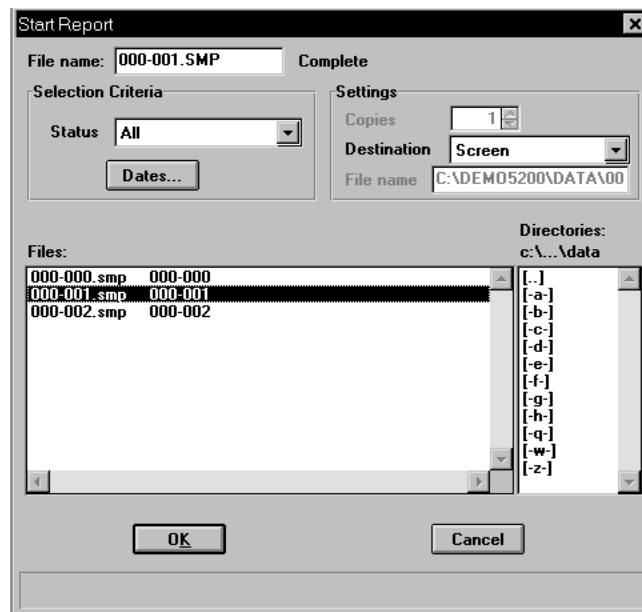
<b>Control chart report</b>	Allows you to generate a control chart report.
<b>PSD history</b>	Allows you to generate a particle size distribution history report.

---

## 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 copied to this field. If you select multiple files, only the last one selected is displayed.

**Status** This drop-down list determines the type of sample files displayed in the **Files:** list box.

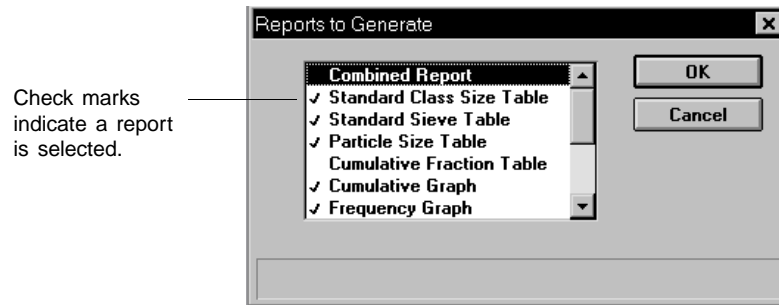
*Choices: All, Analyzing, Complete, Entered*

*All* displays all of the sample files in the specified directory or within the specified range of dates.

*Analyzing* displays sample files that are currently being used in an analysis.

<b>Status</b> ( <i>continued</i> )	<p><i>Complete</i> displays sample files that have been used for at least one analysis.</p> <p><i>Entered</i> displays sample files that contain manually entered data.</p>
	<p>Use this push button to specify a range of dates in which to display sample files. Refer to <b>Selecting Files</b> in Chapter 3 for a description of this push button.</p>
<b>Copies</b>	<p>Enabled when the <i>Printer</i> or <i>Printer/Plotter</i> destination is chosen. This option allows you to print up to four copies of the selected reports.</p>
<b>Destination</b>	<p>Displays a drop-down list of output destinations.</p> <p><i>Choices: File, Printer, Printer/Plotter, Screen</i></p> <p>If you select <i>Printer</i> or <i>Printer/Plotter</i>, requested reports are printed to the selected printer and/or plotter.</p> <p>If you select <i>Screen</i>, many options are available for report manipulation. Refer to <b>Printed Reports</b> later in this chapter for manipulation methods of onscreen reports.</p> <p>If you select <i>File</i>, 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 tool. Graphical data cannot be generated to a <i>File</i>.</p>
<b>File name</b>	<p>Enabled when you select <i>File</i> as the destination. Allows you to enter a name, or you may accept the default.</p>
<b>Files: list box</b>	<p>Displays a list of the available sample files for the choice shown in the <b>Status</b> field.</p>
<b>Directories:</b>	<p>Displays a list of available drives and directories. The drive and directory last accessed is displayed immediately above the <b>Directories:</b> list box.</p>

If you choose a single sample file, the Reports to Generate dialog is displayed. 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 select **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.

---

## 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.

---

## Background

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This option allows you to generate a report on a specified instrument's background. When you select Background from the Reports menu, the Start Background Report dialog is displayed.

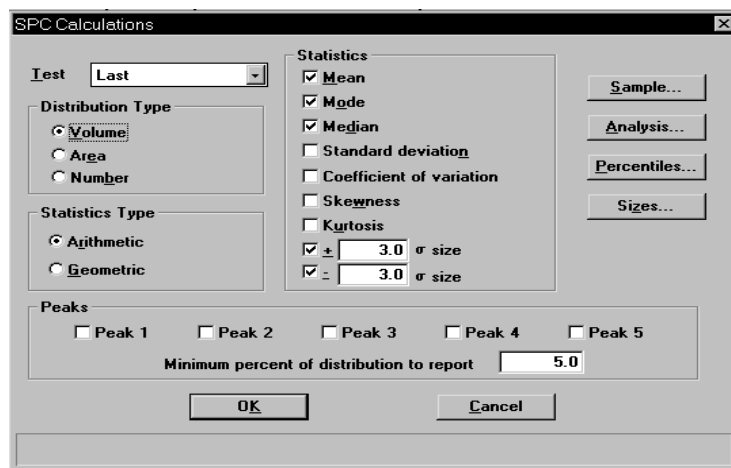


- Instrument** Displays a drop-down list of the attached instruments, allowing you to choose the instrument on which to have a background report generated.
- Background date and time** Displays the date and time the current background was performed on the selected instrument.
- Overlay Samples** Choose this option to overlay the background for a sample (or multiple samples) with the current background. Then click **Samples** to choose the desired file(s).
- Copies** Enabled when the *Printer* or *Printer/Plotter* destination is chosen. This option allows you to print up to four copies of the selected report(s).
- Destination** Displays a drop-down list of output destinations.
- Choices: Screen, Printer, Printer/Plotter, File*
- If you choose *File*, the **File name** field is enabled so that you can enter a name (or you can accept the default name).

## SPC Report Options

This option enables you to select the data that are to be reported in Regression and Control Chart reports. For efficiency, it is best to select only the variables you actually intend to use. All variables selected must be computed for each sample file used in an SPC report. These archived values are used in all future reports unless you have selected **Recalculate archived SPC results** on the individual report dialog.

When you select SPC Report Options, the SPC Calculations dialog is displayed.

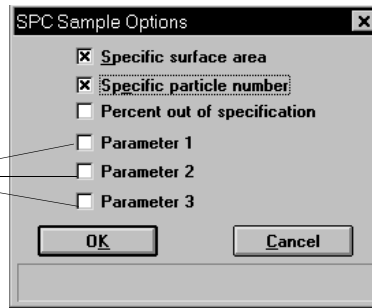


<b>Test</b>	Drop-down list containing analysis choices for SPC calculations.  <i>Last</i> reports statistics for the last analysis.  <i>First</i> reports statistics for the first analysis.  <i>Average</i> reports an average based on all tests in the sample file(s).
<b>Distribution Type Group Box</b>	Allows you to choose the type of distribution data for which the SPC variables are to be computed.
<b>Statistics Type Group Box</b>	Allows you to choose the type of statistics for which the SPC variables are to be calculated.
<b>Statistics Group Box</b>	Displays a list of the variables available for SPC reporting; you may choose as many as you wish.

**Sample**

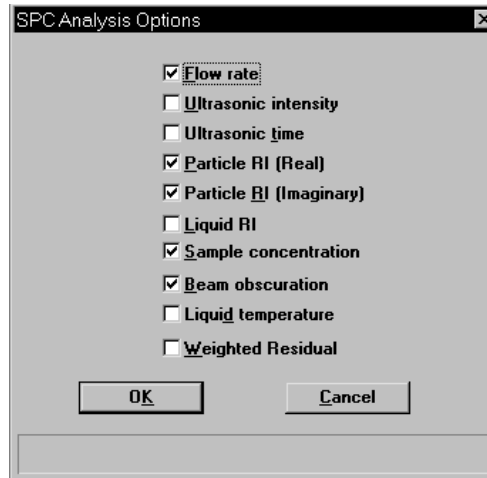
Displays the SPC Sample Options dialog, allowing you to select the sample parameters you wish to have reported.

Specific parameters can be designated in these fields. Refer to **Sample defaults** in Chapter 8 for additional information.



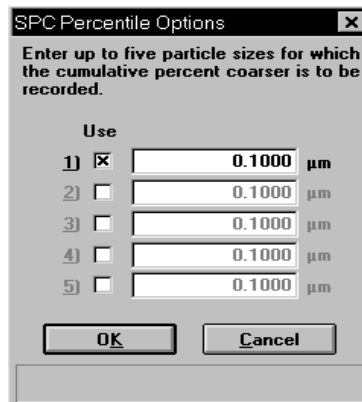
**Analysis**

Displays the SPC Analysis Options dialog, allowing you to select the analysis conditions you wish to have reported.



**Percentiles**

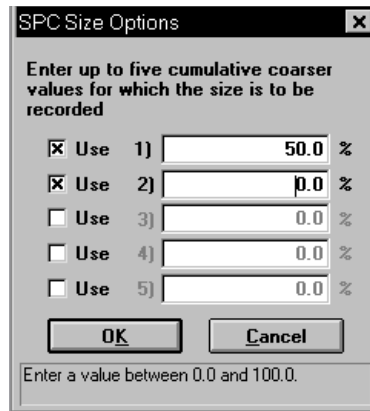
Displays the SPC Percentile Options dialog, allowing you to specify up to five sizes at which the percentiles are to be reported.





**Sizes**

Displays the SPC Size Options dialog, allowing you to specify the percentiles at which the sizes are to be reported.



The image shows a dialog box titled "SPC Size Options" with a close button (X) in the top right corner. The dialog contains the following text and controls:

Enter up to five cumulative coarser values for which the size is to be recorded

- Use 1)  %
- Use 2)  %
- Use 3)  %
- Use 4)  %
- Use 5)  %

At the bottom of the dialog are two buttons: "OK" and "Cancel". Below the buttons is a small text box containing the instruction: "Enter a value between 0.0 and 100.0."

**Peaks**

Allows you to choose the peaks to include in SPC calculations; you can choose up to five. Use the field provided 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 bitmap

Select this option to have a graphic (bitmap format) display above the report title. For example, you may wish to display your company logo.

» Click **Browse** to choose the bitmap.

» Enter the height and width you wish the image to be.

» The image can also be edited from the report window.

### X- and Y-Axes Variable fields

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

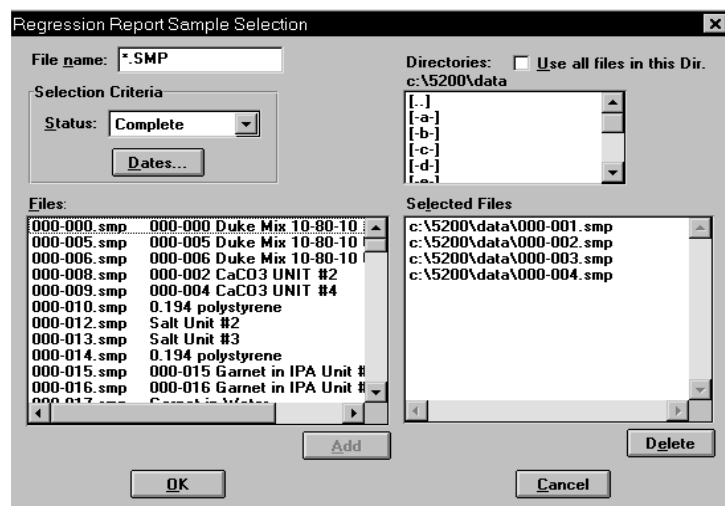
Allows you to generate tabular, as well as graphical, data of the included samples. A tabular report contains the numeric values contributed by each sample.

### 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.



**Samples***(continued)*

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.

**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**  
**Copies**

Enabled when the *Printer* or *Printer/Plotter* destination is chosen. This option allows you to print up to four copies of the selected reports.

**Destination**

Contains destination options for report output.

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

If you choose *File*, enter a name in the **File name** field. Remember, only tabular data can be generated to a file.

**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 bitmap

Select this option to have a graphic (bitmap format) display above the report title. For example, you may wish to display your company logo.

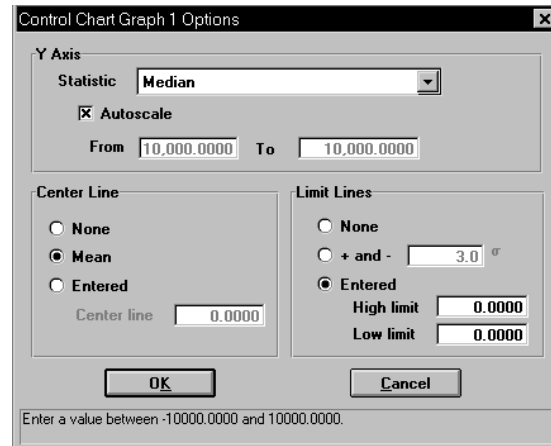
- » Click **Browse** to choose the bitmap.
- » Enter the height and width you wish the image to be.
- » The image can also be edited from the report window.

**X-axis Order By**

Allows you to choose whether statistics are placed in order by file name or analysis time.

**Graph [n]**

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

**Statistic**

This drop-down list displays the SPC variables selected on the SPC Report Options dialog. The variable you choose will be plotted against 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 ( $\sigma$ ) or at specified positions (*Entered*).

**Tabular report**

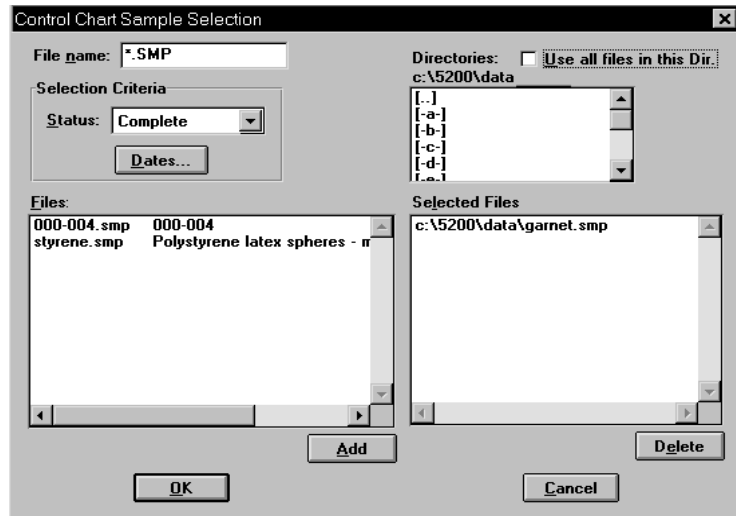
Allows you to generate tabular, as well as graphical, data of the included samples. A tabular report contains the numeric values contributed by each sample.

**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.



This dialog functions in the same manner as the Regression Report Sample Selection dialog explained previously.

**Save as default**

Saves the current definition of the report as the default.

**Report Settings****Copies**

Enabled when the *Printer* or *Printer/Plotter* destination is chosen. This option allows you to print up to four copies of the selected reports.

**Destination**

Contains destination options for report output.

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

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

**Report**

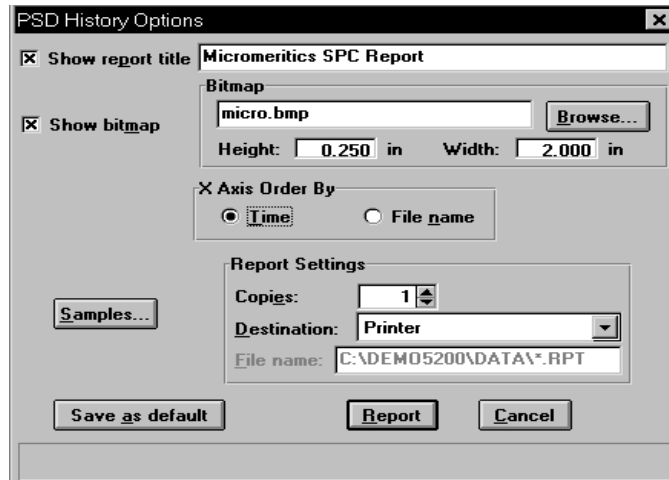
Generates the report.

---

## 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 bitmap** Select this option to have an illustration (bitmap format) display above the report title. For example, you may wish to display your company logo.

» Click **Browse** to choose the bitmap.

» Enter the height and width you wish the image to be.

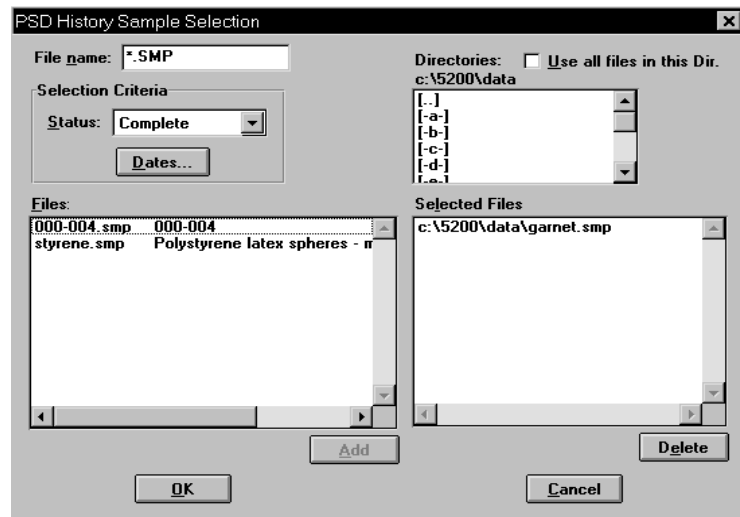
» The image can also be edited from the report window.

**X-axis Order By** Allows you to choose whether statistics are placed in order by file name or analysis time.



**Samples**

Displays the PSD History Sample Selection dialog, allowing you to choose the sample files on which you wish to report.



This dialog functions in the same manner as the Regression Report Sample Selection dialog explained previously.

**Save as default**

Saves the current definition of the report as the default.

## Report Settings

### Copies

Enabled when the *Printer* or *Printer/Plotter* destination is chosen. This option allows you to print up to four copies of the selected reports.

**Destination**

Contains destination options for report output.

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

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

**Report**

Generates the report.

## Printed Reports

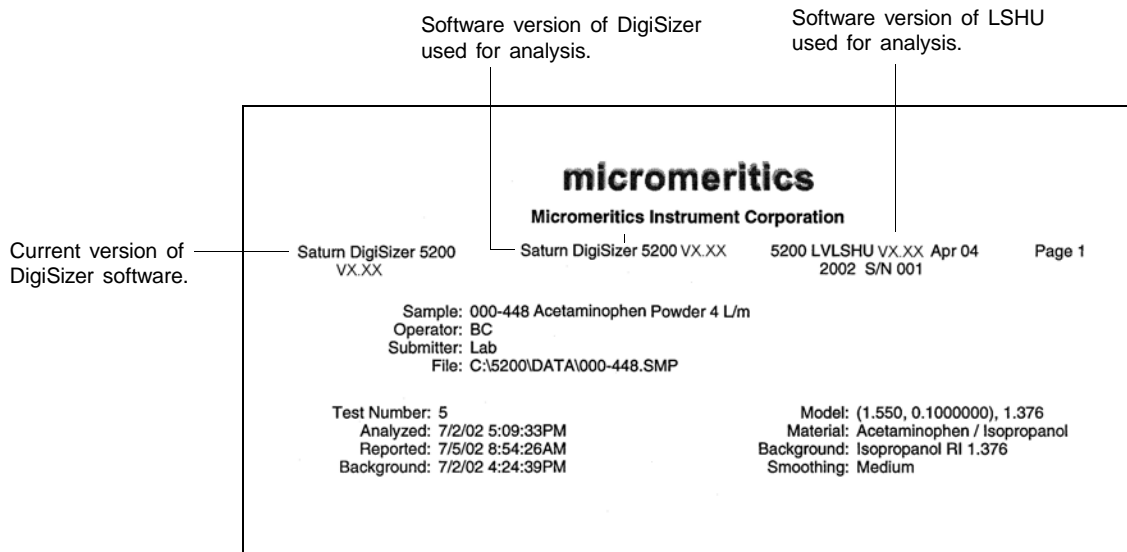
### Header

All printed reports (either to the screen or to a printer) contain a header displaying file statistics.

- Tabular and graphical reports contain sample and instrument statistics such as date and time of analysis, analysis conditions, background data, and so forth.

Headers also contain notes of any changes to the sample file which occur after analysis.

- Summary report headers contain the same type of information displayed in tabular and graphical reports with the exception of notes.
- SPC report headers display the current date as well as the range of dates of the samples you select to have reported.



*The remainder of the information in the report header is self-explanatory.*

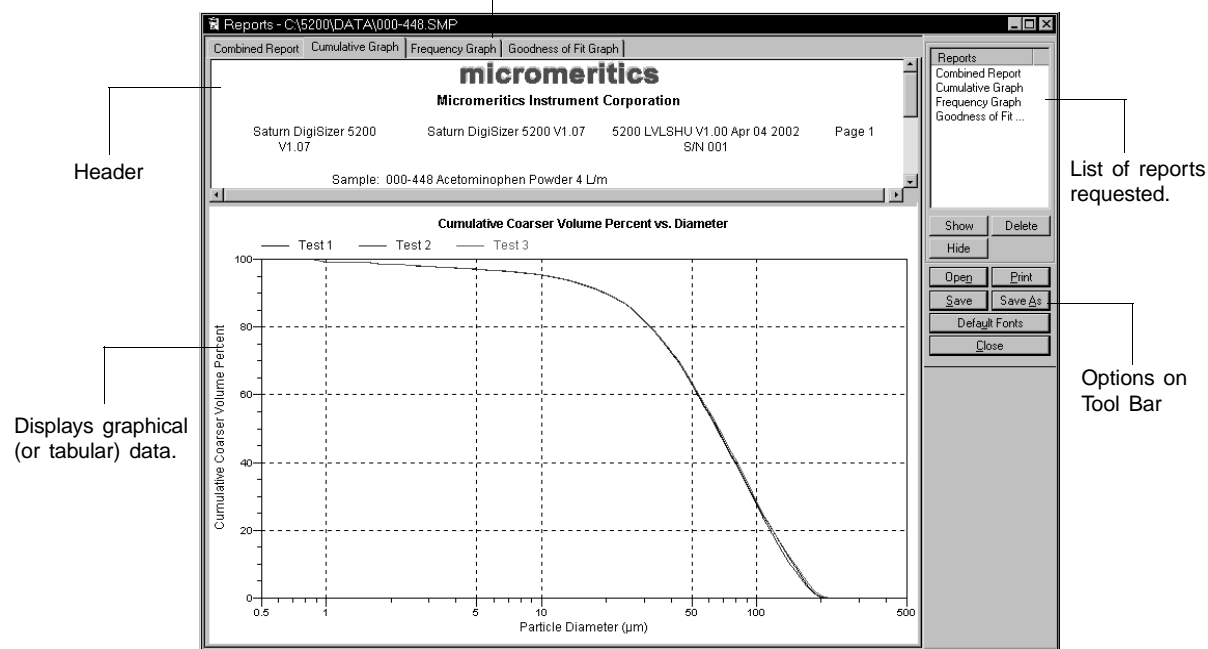
## Onscreen Reports

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

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

Tabs display for each type of report you choose to generate.



## Tool Bar

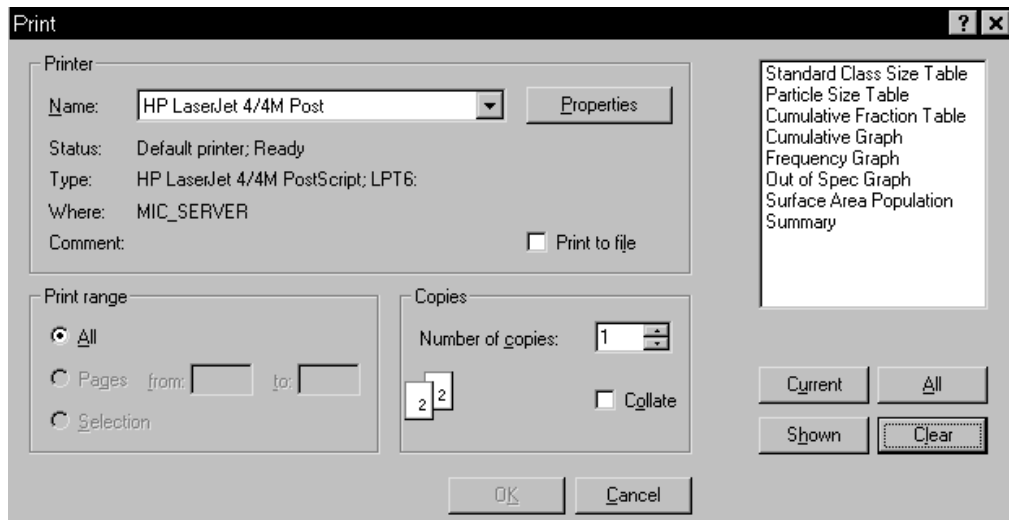
### Reports

Contains a list of all requested reports.

**Show**

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

<b>Delete</b>	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.
<b>Hide</b>	Hides (removes) the selected report from the report window. The report's associated tab is also removed.
<b>Open</b>	Allows you to open a previously saved report file.
<b>Print</b>	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, push buttons 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 unlighted 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:

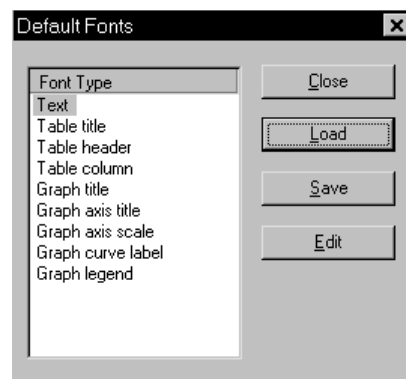
*Report system (\*.rep)*: Saved in a format which allows you to reopen the file using the **Open** push button on the Report window tool bar.

*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.

**Default Fonts**

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.

Click **Edit** to edit the font of a selected item; a font dialog is displayed so that you can specify the desired font and attributes.

Click **Save** to save 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.

**Default Fonts**

*(continued)*

Click **Load** to load the default font of a selected item.

Click **Close** to close the dialog.

## **Pop-up Menus**

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

### **For Tabular Reports**



#### **Resize column**

Displays a dialog so that you can specify the width of the selected column (in inches).

#### **Rename column**

Displays a dialog so that you can edit the name of the selected column. Use **Ctrl** **Enter** to insert line feeds.

#### **Move column**

Allows you to move the location of the selected column to the left or to the right.

#### **Align column**

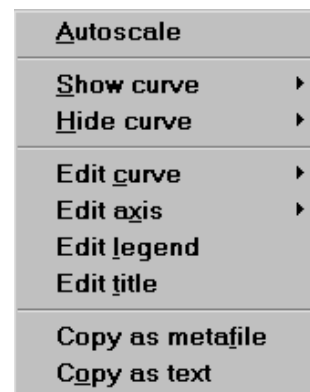
Enables you to right-align, left-align, or center the data in the selected column.

#### **Hide column**

Displays a list of all columns, 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.

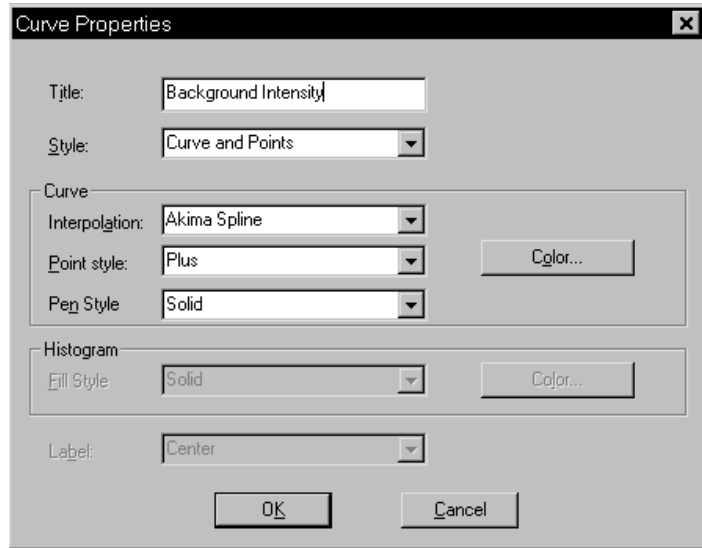
### For Graphs



<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 the Curve Properties dialog, 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.

*Choices: Curve, Histogram, Points, Curve and Points*

**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 color. The options in this group box are disabled if Histogram is chosen in the **Style** drop-down list.

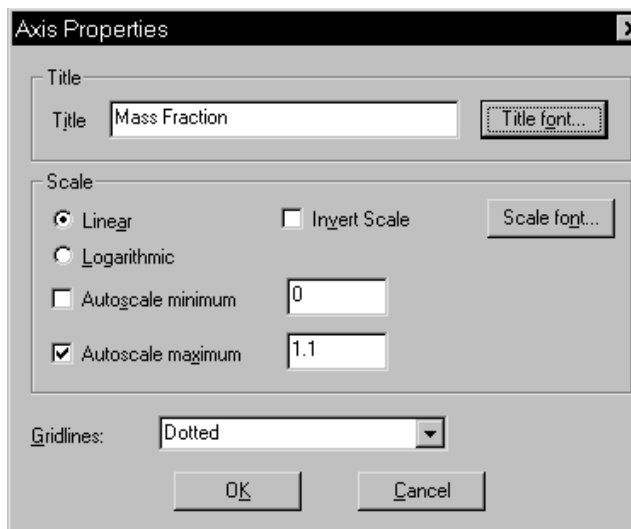
**Histogram group box**

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

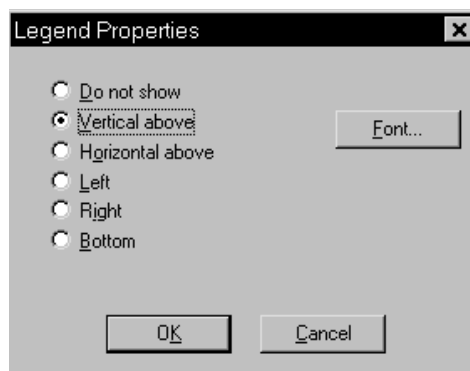


**Edit axis**

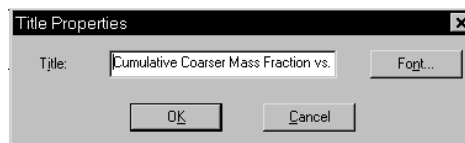
Displays the Axis Properties dialog, allowing you to edit axis properties.

**Edit legend**

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

**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**

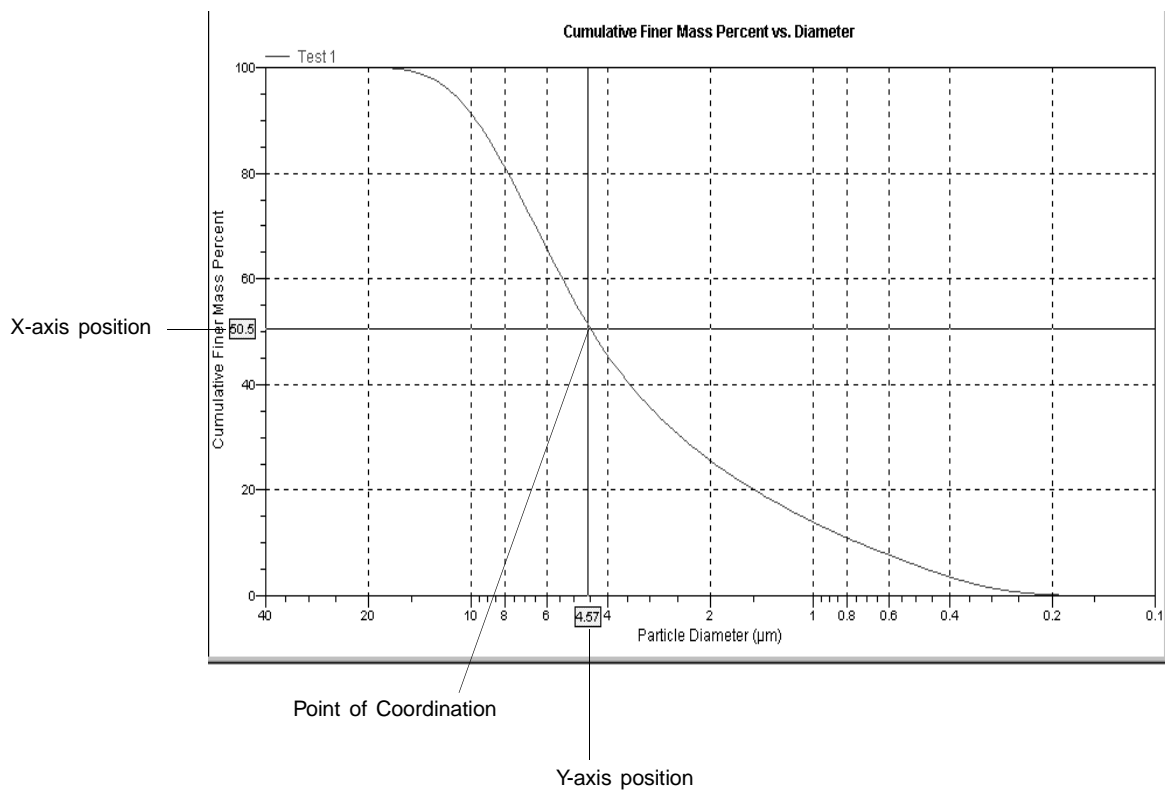
Copies the data used to generate the graph as a series of tab-delimited columns of text.

## 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.

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## Report Examples

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This section contains examples of the types of reports available using the Saturn DigiSizer analysis program.


## Standard Class Size Table

The Standard Class Table reports data in correlation with predefined size classes (40 classes per decade). Up to eight types of data can be reported. Columnar data are specified by editing the Standard Class Size Table report from the Report Options parameter file.

							
Micromeritics Instrument Corporation							
DigiSizer 5200 V1.00	5200 V1.00	Serial Number 105	Page 2				
Sample: Garnet in Water Operator: PW Submitter: Micromeritics File: C:\5200\DATA\000-017.SMP							
Test Number:	3	Model:	(1.800, 1.0000000), 1.331				
Analyzed:	01/28/00 11:05:06	Material:	Garnet / Water				
Reported:	02/17/00 08:27:11	Background:	Water RI 1.331				
Background:	01/28/00 10:28:20	Smoothing:	Medium				
Report by Size Class							
High Diameter (µm)	Low Diameter (µm)	Average Diameter (µm)	Cumulative Volume Coarser (Percent)	Volume Frequency (Percent)	Cum. Vol. Standard Deviation (6 tests)	Cumulative Area Coarser (m <sup>2</sup> /g)	Cumulative Number Coarser (per g)
30.726	29.007	29.854	0.0	0.0	0.0	0.000	3.782 x 10 <sup>3</sup>
29.007	27.384	28.184	0.0	0.0	0.0	0.000	7.419 x 10 <sup>3</sup>
27.384	25.852	26.607	0.0	0.0	0.0	0.000	1.323 x 10 <sup>4</sup>
25.852	24.406	25.119	0.1	0.0	0.0	0.000	2.211 x 10 <sup>4</sup>
24.406	23.041	23.714	0.1	0.0	0.0	0.000	3.550 x 10 <sup>4</sup>
23.041	21.752	22.387	0.1	0.0	0.0	0.000	5.626 x 10 <sup>4</sup>
21.752	20.535	21.135	0.2	0.0	0.0	0.000	9.000 x 10 <sup>4</sup>
20.535	19.387	19.953	0.2	0.1	0.0	0.000	1.473 x 10 <sup>5</sup>
19.387	18.302	18.836	0.3	0.1	0.0	0.000	2.467 x 10 <sup>5</sup>
18.302	17.278	17.783	0.4	0.1	0.0	0.001	4.188 x 10 <sup>5</sup>
17.278	16.312	16.788	0.6	0.2	0.0	0.001	7.120 x 10 <sup>5</sup>
16.312	15.399	15.849	0.9	0.3	0.0	0.001	1.199 x 10 <sup>6</sup>
15.399	14.538	14.962	1.2	0.4	0.0	0.002	1.987 x 10 <sup>6</sup>
14.538	13.725	14.125	1.8	0.5	0.0	0.002	3.223 x 10 <sup>6</sup>
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
0.173	0.163	0.168	100.0	0.0	0.1	0.774	9.464 x 10 <sup>11</sup>
0.163	0.154	0.158	100.0	0.0	0.1	0.775	9.666 x 10 <sup>11</sup>
0.154	0.145	0.150	100.0	0.0	0.1	0.776	9.815 x 10 <sup>11</sup>


## Standard Sieve Table

The Standard Sieve Table reports data for each sieve size in the selected range. Sieve sizes are specified by selecting **Data presentation, Sieve table** from the Options menu.

 Micromeritics Instrument Corporation						
DigiSizer 5200 V1.00	5200 V1.00	Serial Number 105	Page 6			
Sample: Garnet in Water Operator: PW Submitter: Micromeritics File: C:\5200\DATA\000-017.SMP						
Test Number:	6	Model:	(1.800, 1.0000000), 1.331			
Analyzed:	01/28/00 11:05:06	Material:	Garnet / Water			
Reported:	02/17/00 08:09:21	Background:	Water RI 1.331			
Background:	01/28/00 10:28:20	Smoothing:	Medium			
Report by Sieve Size						
Sieve Name	Aperture Size (µm)	Cumulative Volume Retained (Percent)	Cum. Mass Standard Deviation (6 tests)	Volume Frequency (Percent)	Cumulative Area Coarser (m <sup>2</sup> /g)	Cumulative Number Coarser (per g)
No. 635	20.0	99.8	0.0	0.1	0.000	1.125 x 10 <sup>5</sup>
No. 500	25.0	99.9	0.0	0.1	0.000	1.798 x 10 <sup>4</sup>
No. 450	32.0	100.0	0.0	0.0	0.000	8.429 x 10 <sup>2</sup>

## Particle Size Table

The Particle Size Table reports data in correlation with user-specified size classes. Up to eight types of data can be reported. Size classes and columnar data are specified by editing the Particle Size Table report from the Report Options parameter file.

 Micromeritics Instrument Corporation							
DigiSizer 5200 V1.00	5200 V1.00	Serial Number 105	Page 7				
Sample: Garnet in Water Operator: PW Submitter: Micromeritics File: C:\5200\DATA\000-017.SMP							
Test Number:	6	Model:	(1.800, 1.0000000), 1.331				
Analyzed:	01/28/00 11:05:06	Material:	Garnet / Water				
Reported:	02/15/00 16:39:21	Background:	Water RI 1.331				
Background:	01/28/00 10:28:20	Smoothing:	Medium				
Report by Size Table							
High Diameter ( $\mu\text{m}$ )	Low Diameter ( $\mu\text{m}$ )	Cumulative Volume Finer (Percent)	Volume Frequency (Percent)	Area in Interval ( $\text{m}^2/\text{g}$ )	Number in Interval (per g)	Out of Spec (-%<,+%>)	Difference From Reference (% Finer)
40.000	30.000	100.0	0.0	0.000	$2.396 \times 10^3$	0.0	0.2
30.000	25.000	99.9	0.1	0.000	$1.559 \times 10^4$	0.0	0.4
25.000	20.000	99.8	0.1	0.000	$9.451 \times 10^4$	0.0	0.3
20.000	15.000	99.0	0.8	0.001	$1.400 \times 10^6$	-0.1	0.1
15.000	10.000	91.2	7.8	0.012	$2.914 \times 10^7$	0.0	1.5
10.000	8.000	81.8	9.6	0.017	$7.161 \times 10^7$	0.0	2.4
8.000	6.000	66.3	15.4	0.035	$2.399 \times 10^8$	0.0	3.2
6.000	5.000	56.5	9.7	0.027	$2.956 \times 10^8$	0.0	3.7
5.000	4.000	46.0	10.5	0.036	$5.830 \times 10^8$	0.0	4.4
4.000	3.000	35.6	10.4	0.046	$1.251 \times 10^9$	0.0	5.3
3.000	2.000	25.1	10.6	0.067	$3.710 \times 10^9$	0.0	5.3
2.000	1.500	19.3	5.8	0.052	$5.666 \times 10^9$	0.0	4.6
1.500	1.000	12.8	6.5	0.082	$1.819 \times 10^{10}$	0.0	3.5
1.000	0.800	10.0	2.8	0.049	$1.969 \times 10^{10}$	0.0	2.9
0.800	0.600	7.0	3.0	0.069	$4.707 \times 10^{10}$	0.0	2.4
0.600	0.500	5.2	1.8	0.050	$5.415 \times 10^{10}$	0.0	2.1
0.500	0.400	3.2	2.0	0.067	$1.082 \times 10^{11}$	0.0	1.8
0.400	0.300	1.3	1.9	0.081	$2.174 \times 10^{11}$	0.0	1.1
0.300	0.200	0.2	1.2	0.069	$3.538 \times 10^{11}$	0.0	0.2

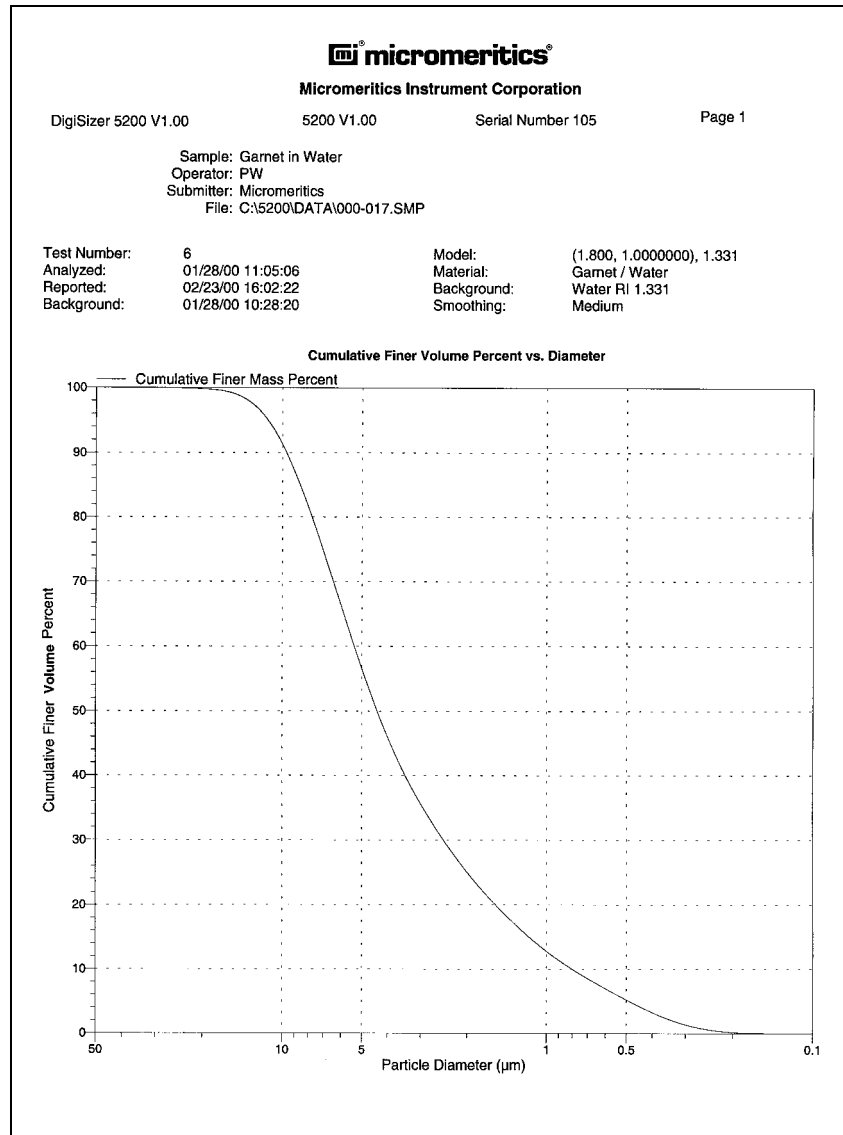
## Cumulative Fraction Table

The Cumulative Fraction Table reports data in correlation with user-specified cumulative fractions. Up to eight types of data can be reported. Columnar data are specified by editing the Cumulative Fraction Table report from the Report Options parameter file.

<b>micromeritics®</b>							
Micromeritics Instrument Corporation							
DigiSizer 5200 V1.00	5200 V1.00	Serial Number 105	Page 8				
Sample: Garnet in Water Operator: PW Submitter: Micromeritics File: C:\5200\DATA\000-017.SMP							
Test Number:	6	Model:	(1.800, 1.0000000), 1.331				
Analyzed:	01/28/00 11:05:06	Material:	Garnet / Water				
Reported:	02/15/00 16:39:21	Background:	Water R1 1.331				
Background:	01/28/00 10:28:20	Smoothing:	Medium				
Report by Volume Percent							
High Diameter (µm)	Low Diameter (µm)	Cumulative Volume Finer (Percent)	Volume Frequency (Percent)	Difference From Reference (% Finer)	Out of Spec (-%<,+%>)	Area in Interval (m <sup>2</sup> /g)	Number in Interval (per g)
0.801	0.490	5.0	5.0	2.1	0.0	0.126	1.092 x 10 <sup>11</sup>
1.164	0.801	10.0	5.0	2.9	0.0	0.080	2.835 x 10 <sup>10</sup>
1.560	1.164	15.0	5.0	3.9	0.0	0.058	1.038 x 10 <sup>10</sup>
1.995	1.560	20.0	5.0	4.7	0.0	0.044	4.615 x 10 <sup>9</sup>
2.454	1.995	25.0	5.0	5.3	0.0	0.035	2.317 x 10 <sup>9</sup>
2.938	2.454	30.0	5.0	5.5	0.0	0.029	1.305 x 10 <sup>9</sup>
3.427	2.938	35.0	5.0	5.3	0.0	0.025	7.868 x 10 <sup>8</sup>
3.904	3.427	40.0	5.0	4.9	0.0	0.021	5.060 x 10 <sup>8</sup>
4.375	3.904	45.0	5.0	4.5	0.0	0.019	3.486 x 10 <sup>8</sup>
4.851	4.375	50.0	5.0	4.1	0.0	0.017	2.519 x 10 <sup>8</sup>
5.343	4.851	55.0	5.0	3.8	0.0	0.015	1.872 x 10 <sup>8</sup>
5.862	5.343	60.0	5.0	3.5	0.0	0.014	1.414 x 10 <sup>8</sup>
6.422	5.862	65.0	5.0	3.3	0.0	0.013	1.082 x 10 <sup>8</sup>
7.042	6.422	70.0	5.0	3.0	0.0	0.012	8.253 x 10 <sup>7</sup>
7.746	7.042	75.0	5.0	2.8	0.0	0.011	6.274 x 10 <sup>7</sup>
8.584	7.746	80.0	5.0	2.5	0.0	0.010	4.716 x 10 <sup>7</sup>
9.668	8.584	85.0	5.0	2.1	0.0	0.009	3.454 x 10 <sup>7</sup>
11.362	9.668	90.0	5.0	1.6	0.0	0.008	2.406 x 10 <sup>7</sup>
205.040	11.362	95.0	5.0	0.9	-0.0	0.007	1.341 x 10 <sup>7</sup>
205.040	205.040	100.0	0.0	0.0	0.0	0.000	0.000 x 10 <sup>0</sup>

## Cumulative Graph

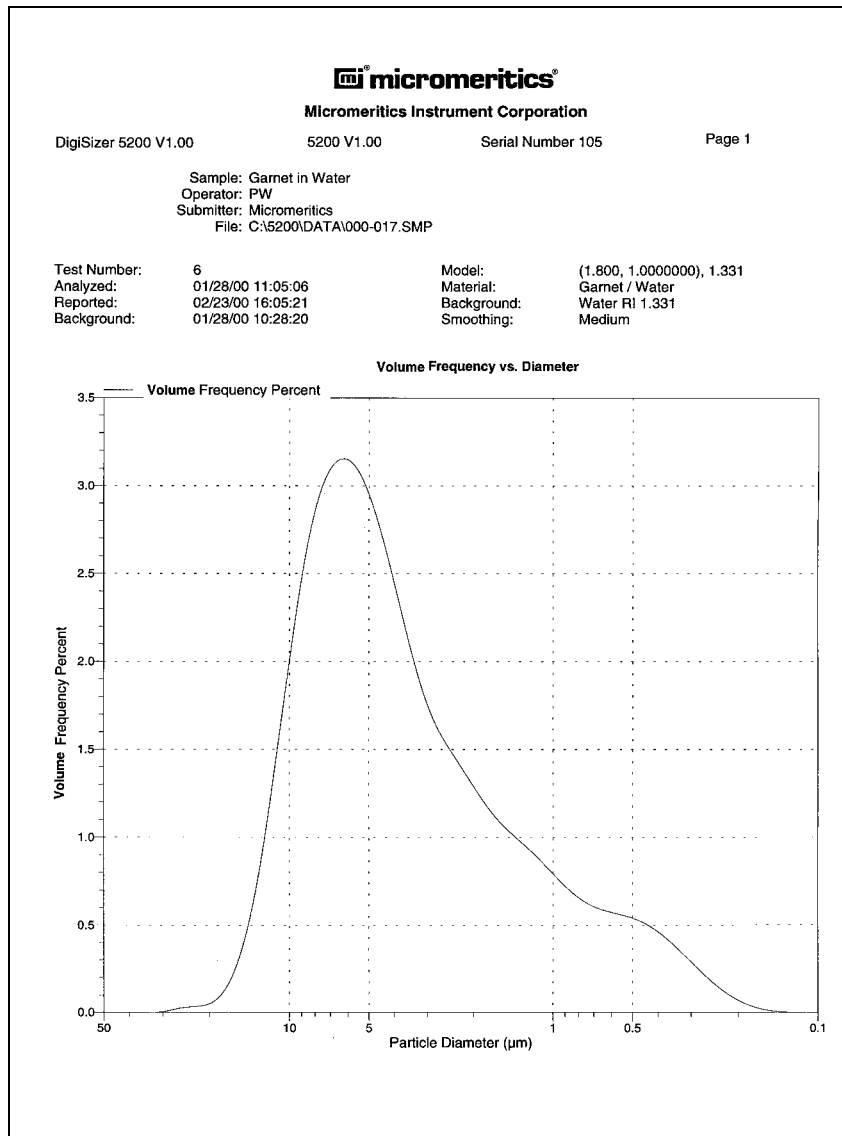
The Cumulative Graph report graphically depicts collected data as cumulative volume percent (or fraction) vs. diameter. These data can be reported as percent (or fraction) coarser or percent (or fraction) finer than diameter. Make this choice by selecting **Data presentation** from the Options menu.





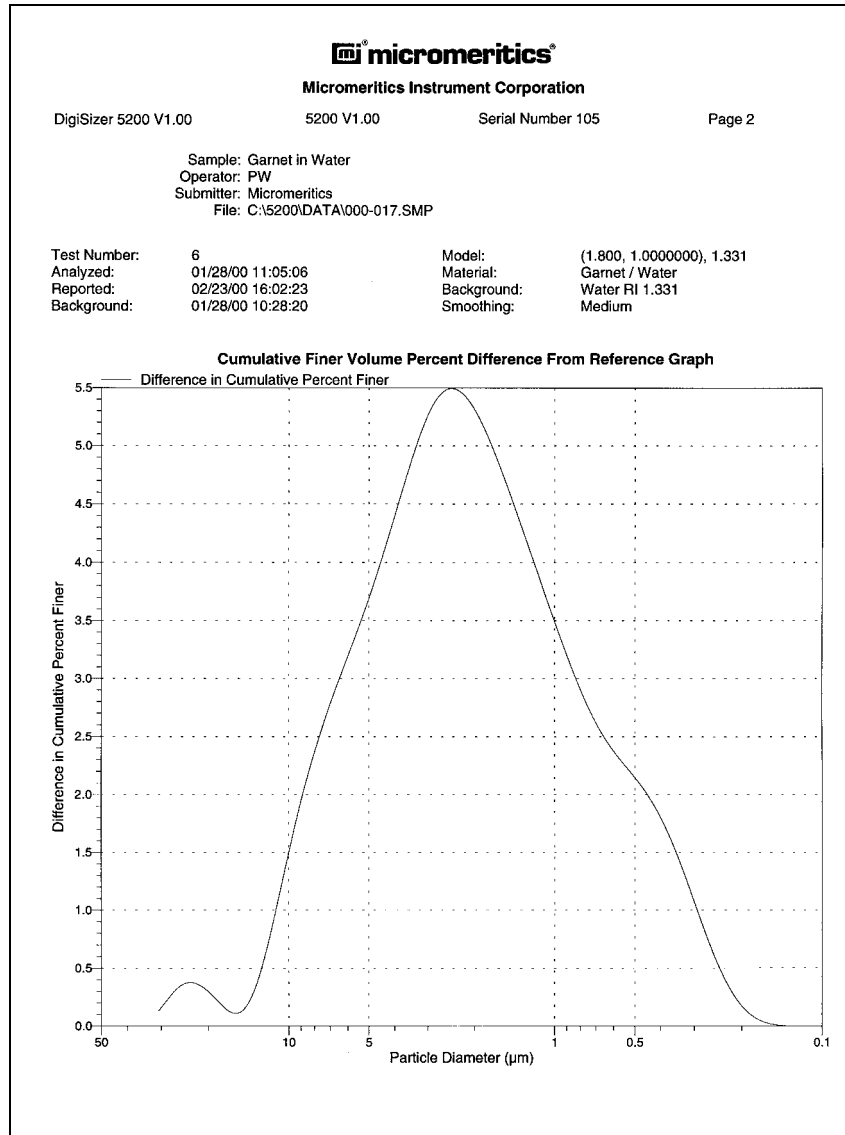
## Frequency Graph

The Frequency Graph report graphically depicts collected data as volume frequency (in size classes) vs. diameter. Data can be reported as a differential plot or as a histogram. This option can be chosen either by editing the report using the Report Options dialog or from the report window (if printed to the screen).



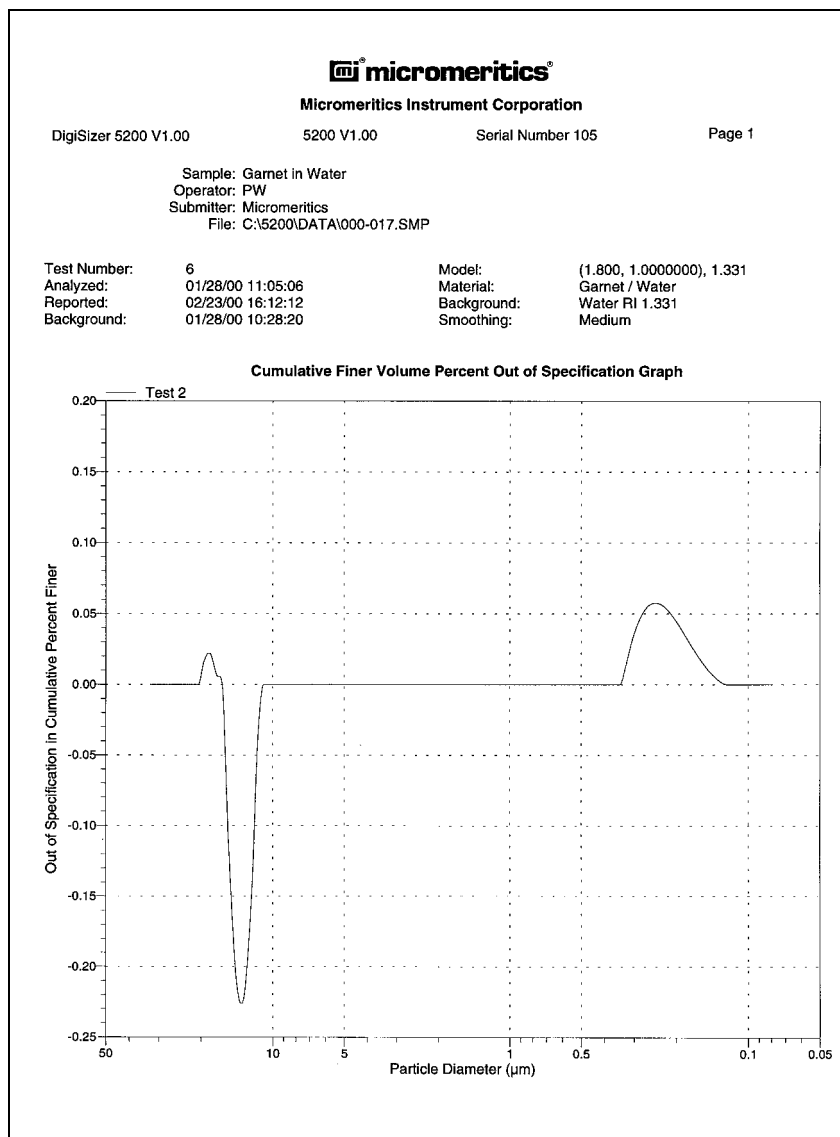
## Difference from Reference Graph

The Difference from Reference report graphically compares the cumulative mass data measured from the current sample with that of a selected reference sample. The reference file is chosen by selecting **Reference...** from the Report Options dialog. These data can be reported as percent (or fraction) coarser or percent (or fraction) finer than diameter. Make this choice by selecting **Data presentation** from the Options menu.



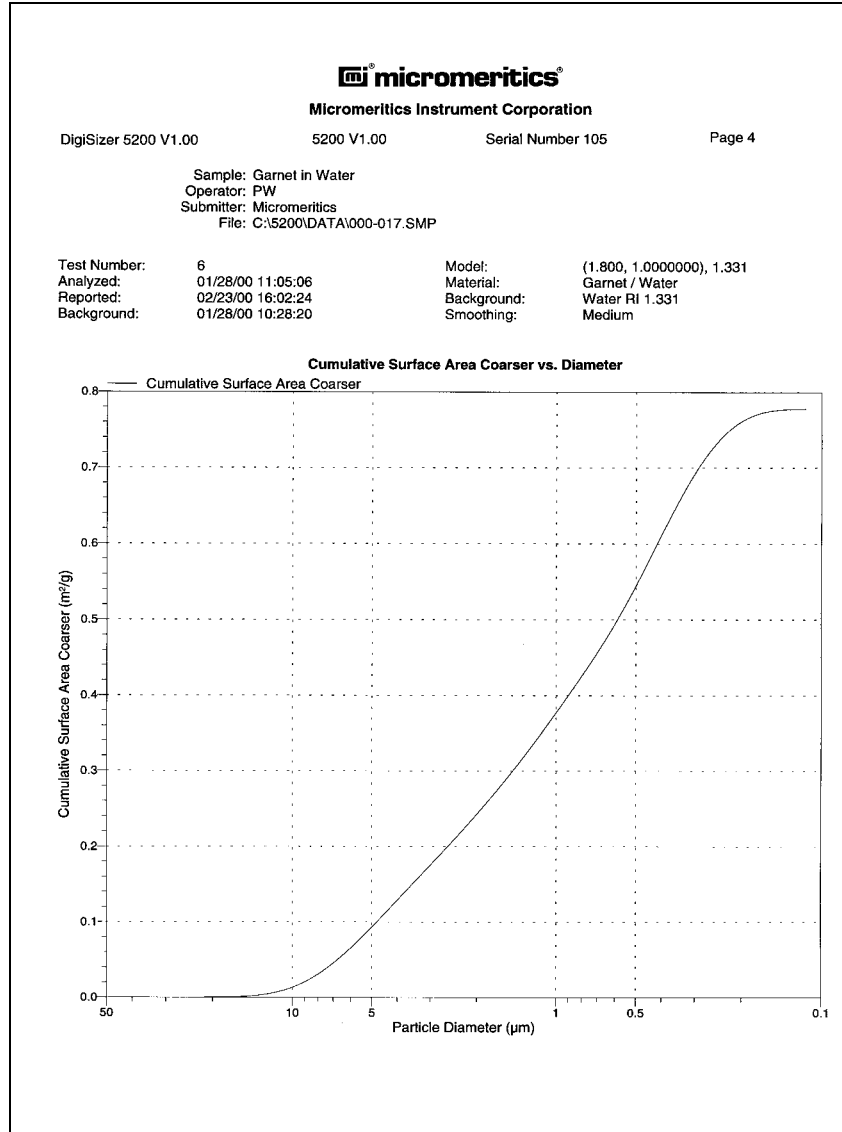
## Out of Specification Graph

The Out of Specification report graphically compares the cumulative mass data measured from the current sample with that contained in two selected sample files; one specifying a coarse limit and the other specifying a fine limit. These sample files are chosen by selecting **Specification...** from the Report Options dialog. These data can be reported as percent coarser or percent finer than diameter. Make this choice by selecting **Data presentation** from the Options menu.



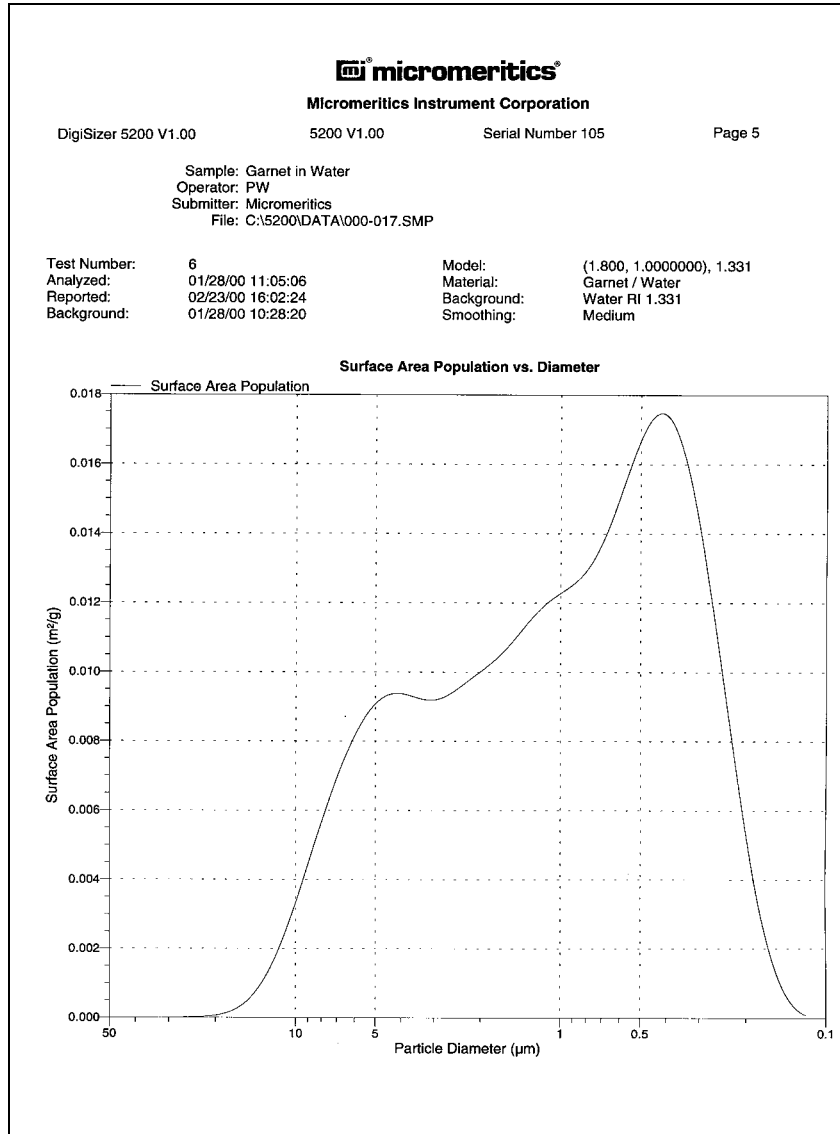
## Surface Area Graph

The Surface Area report graphically depicts the cumulative surface area vs. the diameter.



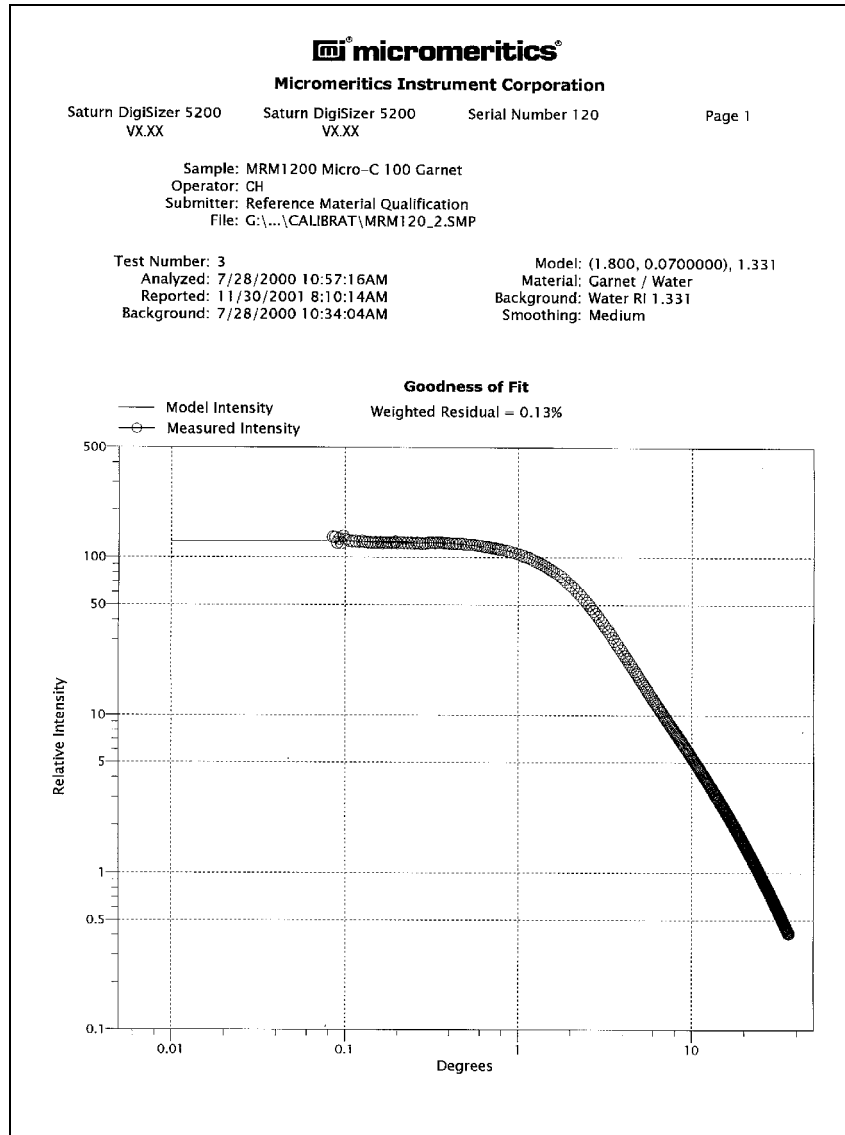
## Surface Area Population Graph

The Surface Area Population report graphically depicts the surface area population vs. the diameter.



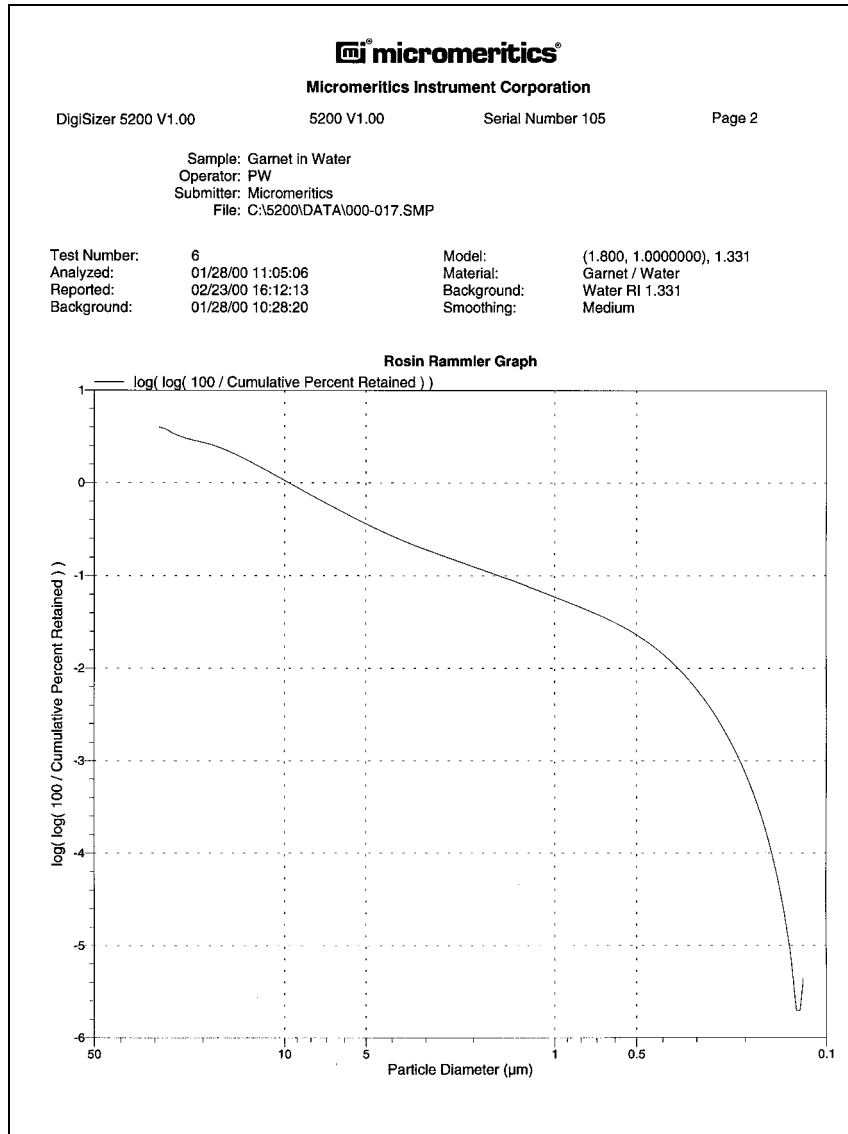
## Goodness of Fit Graph

The Goodness of Fit report compares the collected data as light intensity for all collected angles to the theoretical Mie model or to the light intensity data of other tests or samples.



## Rosin Rammler Graph

The Rosin Rammler report depicts collected data as applied to the Rosin Rammler theory.



## Summary Report

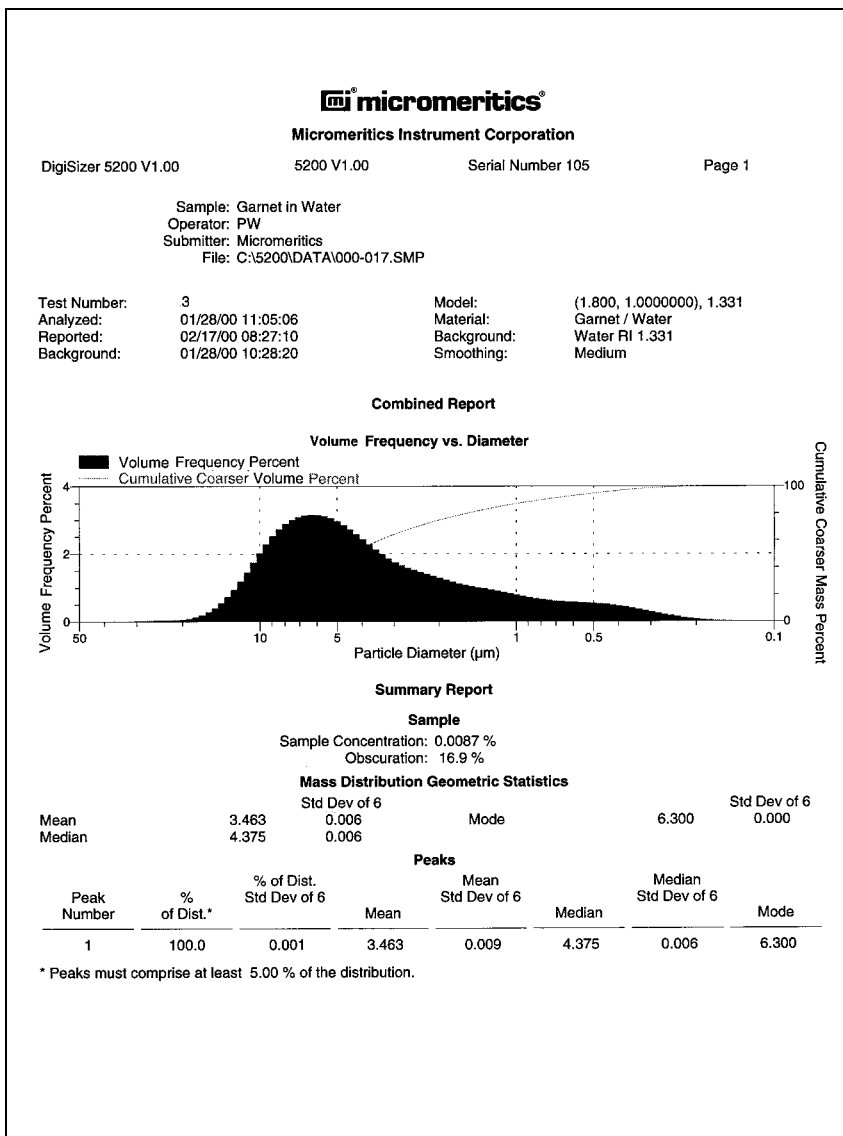
The Summary report is a tabular report of user-specified statistics. Statistics are specified by editing the Summary Report from the Report Options dialog.

<b>micromeritics®</b>			
Micromeritics Instrument Corporation			
DigiSizer 5200 V1.00	5200 V1.00	Serial Number 105	Page 18
Sample: Garnet in Water Operator: PW Submitter: Micromeritics File: C:\5200\DATA\000-017.SMP			
Test Number: 6	Model: (1.800, 1.0000000), 1.331		
Analyzed: 01/28/00 11:05:06	Material: Garnet / Water		
Reported: 02/17/00 08:09:25	Background: Water RI 1.331		
Background: 01/28/00 10:28:20	Smoothing: Medium		
Summary Report			
Analysis Conditions			
FlowRate: 12.0 l/m	Ultrasonic intensity: 50 %		
Circulation time: 30 sec	Ultrasonic time: 30 sec		
Particle Properties		Analysis Liquid Properties	
Refractive Index: (Re)1.800, (Im)1.000	Refractive Index: 1.331		
Density: 3.870 g/cm <sup>3</sup>	Viscosity: 0.890 cp		
Smoothing: Medium	Temperature: 28.560 °C		
User Parameters			
Parameter 1: 0.000	Parameter 2: 0.000	Parameter 3: 0.000	
References			
Reference: 000-015.SMP	000-015 Garnet in IPA Unit #2		
Coarse Specification: 000-016.SMP	000-016 Garnet in IPA Unit #3		
Fine Specification: 000-018.SMP	Garnet in Water, Unit #3		
Sample			
Sample Concentration: 0.0087 %			
Obscuration: 16.9 %			
Volume Distribution Geometric Statistics			
	Std Dev of 6		Std Dev of 6
Mean	3.463	Mode	6.300
Median	4.375		0.000
	0.006		0.006
Area Distribution Geometric Statistics			
	Std Dev of 6		Std Dev of 6
Mean	1.106	Mode	0.421
Median	0.946	Std. Dev.	3.000
Std. Dev. Log.	0.477	Skewness	0.337
Kurtosis	-0.930	+ 3.0 Std Dev	29.86
- 3.0 Std Dev	0.041		1.378
	0.045		0.012
	0.034		0.089
	0.012		0.037
	0.019		1.378
	0.005		
Number Distribution Geometric Statistics			
	Std Dev of 6		Std Dev of 6
Mean	0.313	Mode	0.266
Median	0.291	Std. Dev.	1.661
Std. Dev. Log.	0.220	Skewness	1.181
Kurtosis	2.719	+ 3.0 Std Dev	1.435
- 3.0 Std Dev	0.068		0.051
	0.040		0.030
	0.037		0.069
	0.017		0.150
	0.587		1.435
	0.014		0.051



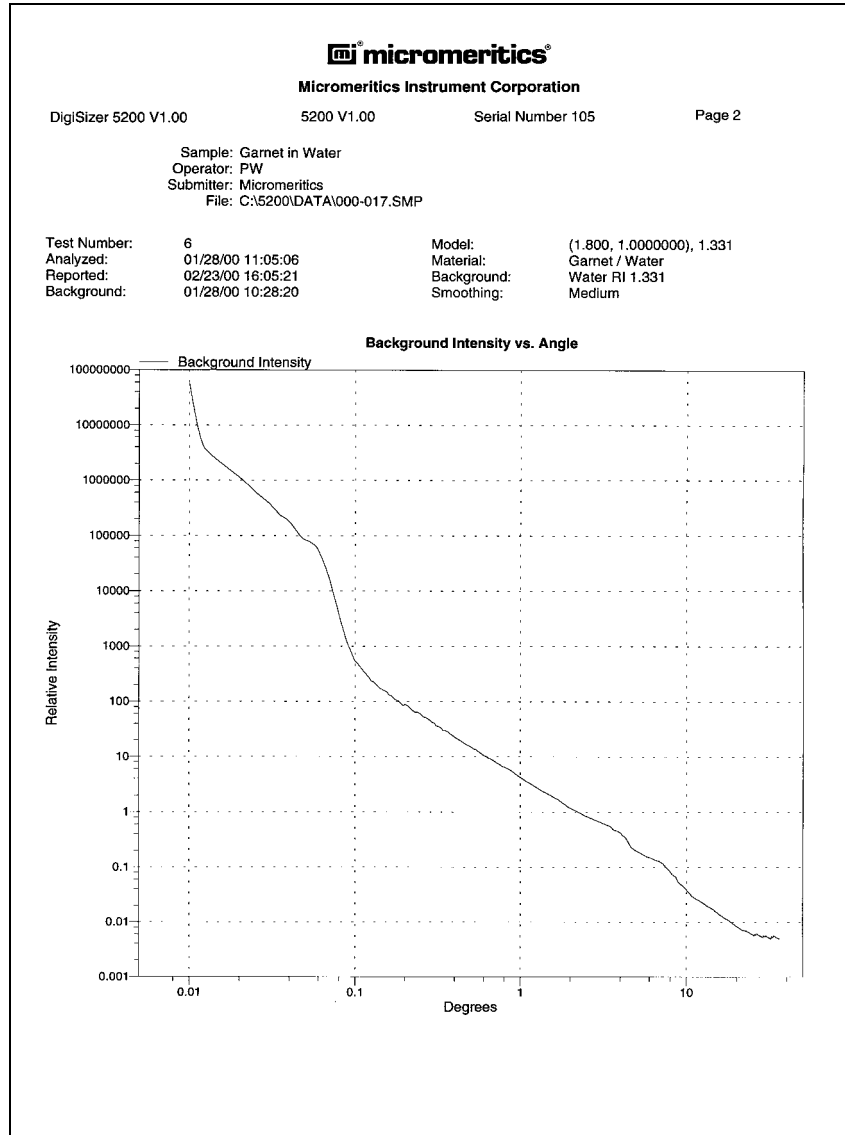
## Combined Report

The Combined report depicts user-specified tabular and/or graphical data in a concise format. The type of data to be reported is specified by editing the Combined Report from the Report Options dialog.



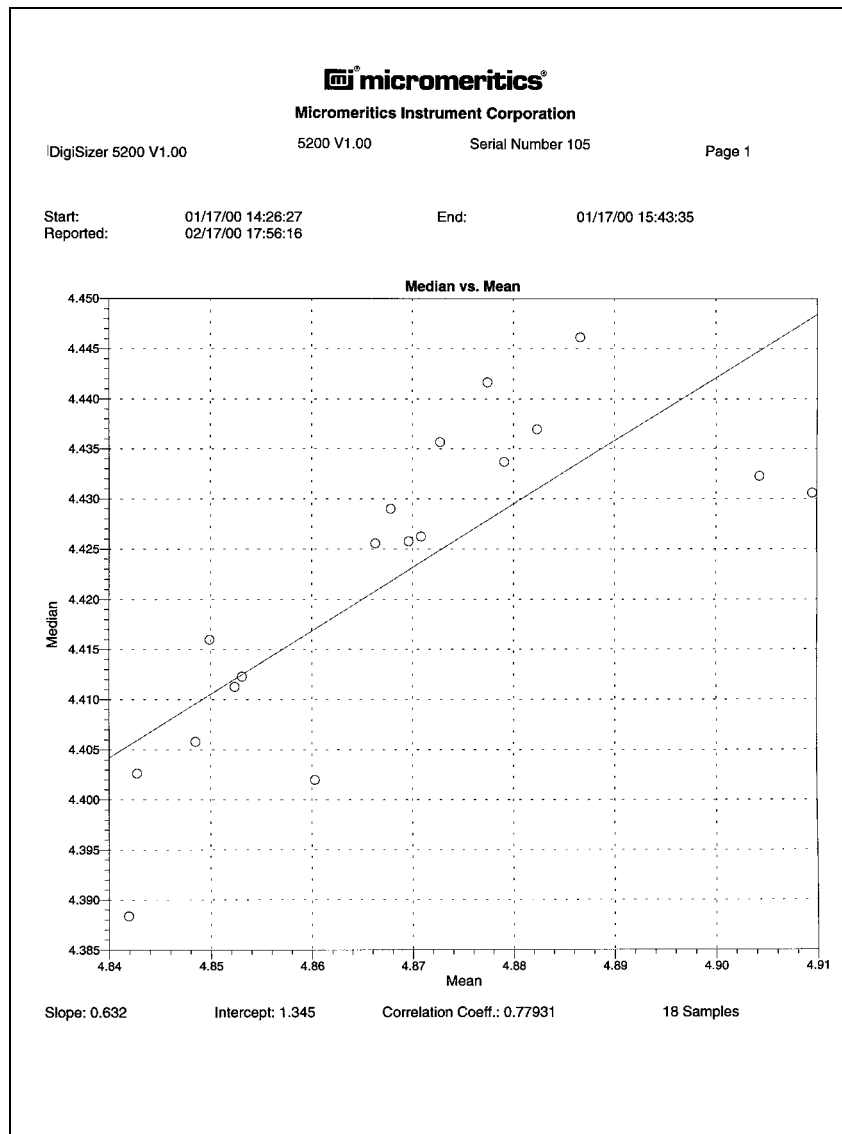
## Background Graph

The Background reports the light intensity vs. scattering angle of the current background. Although not shown in this example, you can also generate overlays for backgrounds of multiple samples (refer to Background in this chapter). Other pertinent data are given in the header of the report.



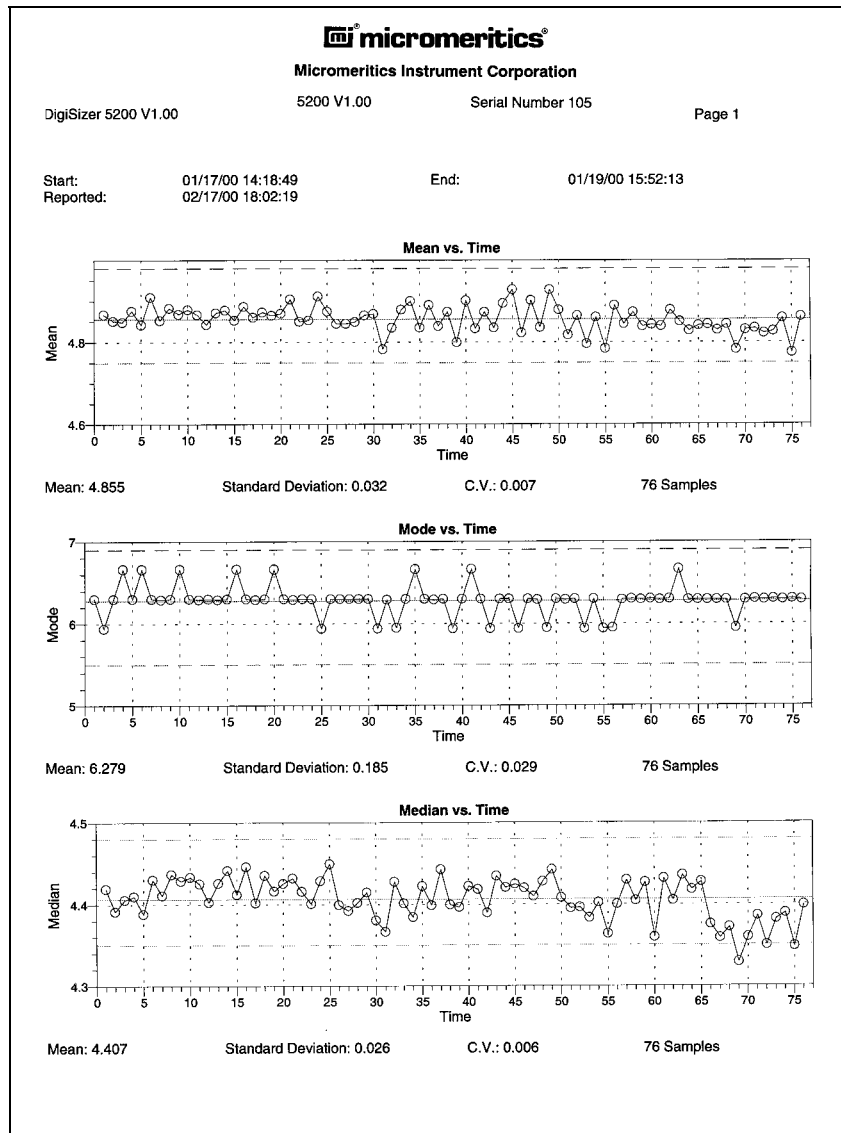
## SPC Regression Report

The Regression report depicts the interdependency between two variables. You can plot up to three dependent variables against a single independent variable. All graphs are scaled to fit on one page, regardless of how many dependent variables you choose. Each point is shown as a circle. You can select **Tabular report** and receive a tabular report containing the numeric values contributed by each sample. If you select **Label data**, each point is labeled with the corresponding row number in the table. This report is defined and generated by selecting Regression report from the Reports menu.



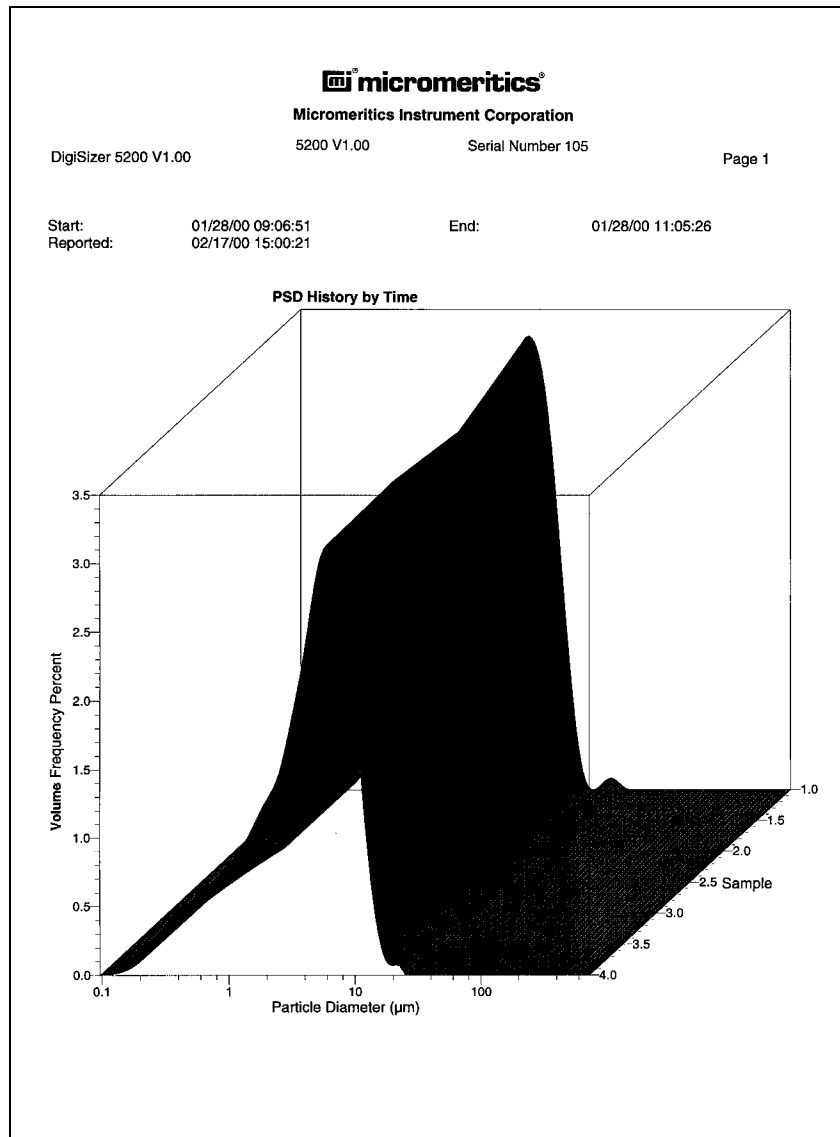
## SPC Control Chart Report

The Control Chart report depicts the changes in a statistic for specified samples. You can plot up to three variables. All graphs are scaled to fit on one page, regardless of how many variables you choose. Each point is shown as a circle. You can select **Tabular report** and receive a tabular report containing the numeric values contributed by each sample. You also have the option of specifying an average center line (solid) and limit lines (dotted). This report is defined and generated by selecting Control chart report from the Reports menu.



## PSD History Report

The PSD History report depicts a sequence of the full particle size distribution for specified samples. This report is defined and generated by selecting PSD history report from the Reports menu.

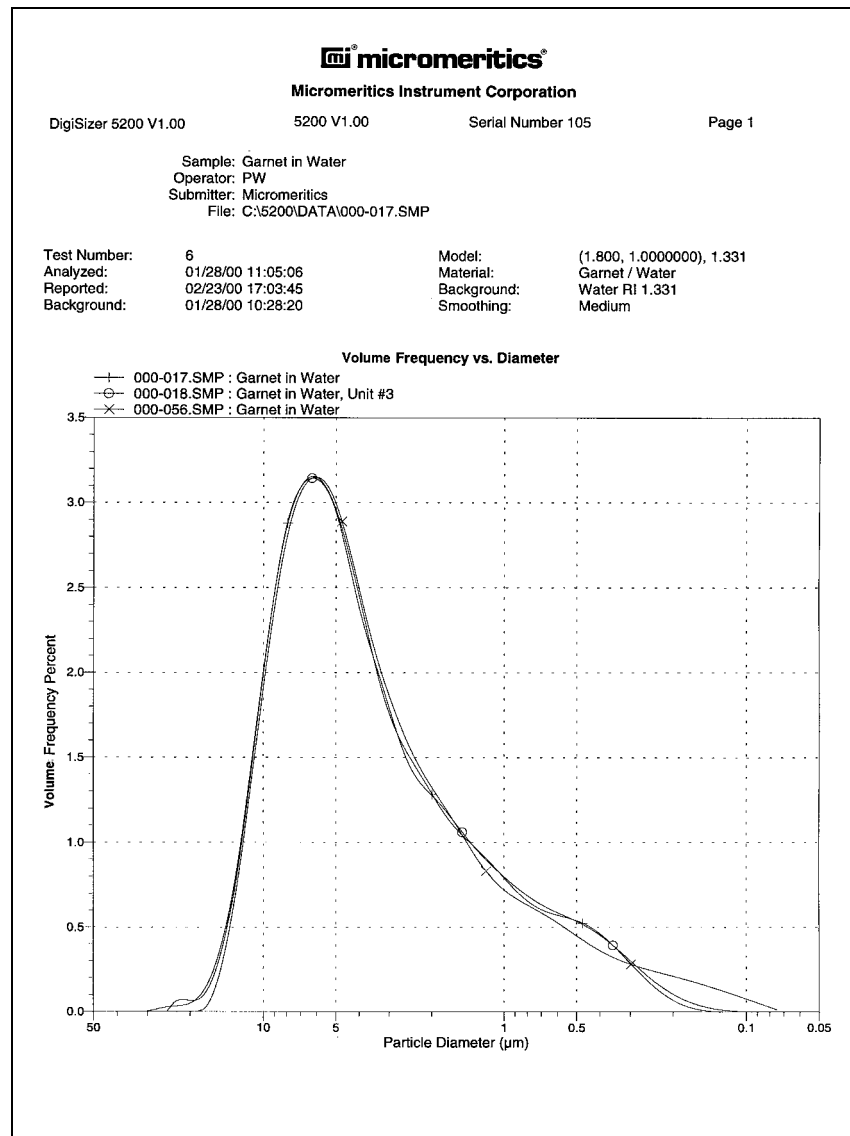


## Graph Overlay

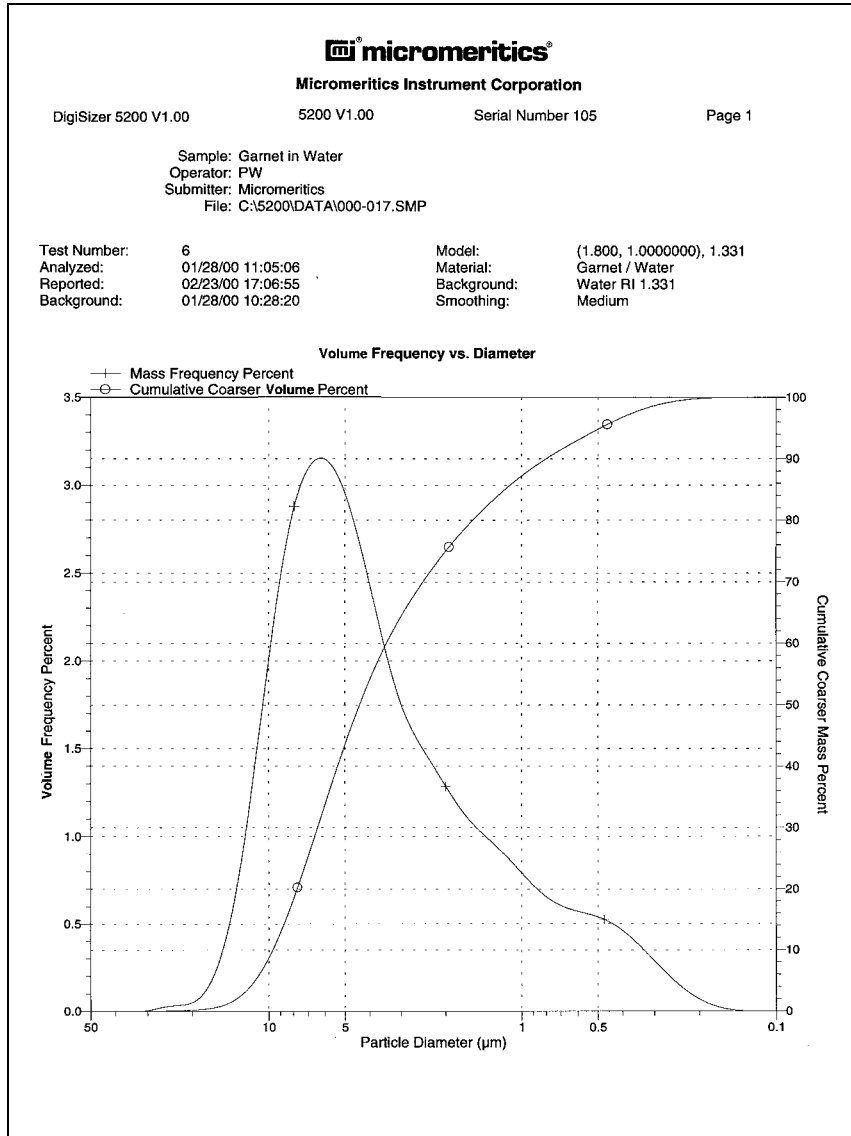
Overlays can be generated in several different ways:

- multiple graphs from one sample file
- the same type of graph from all tests of one sample file
- the same type of graph from multiple sample files

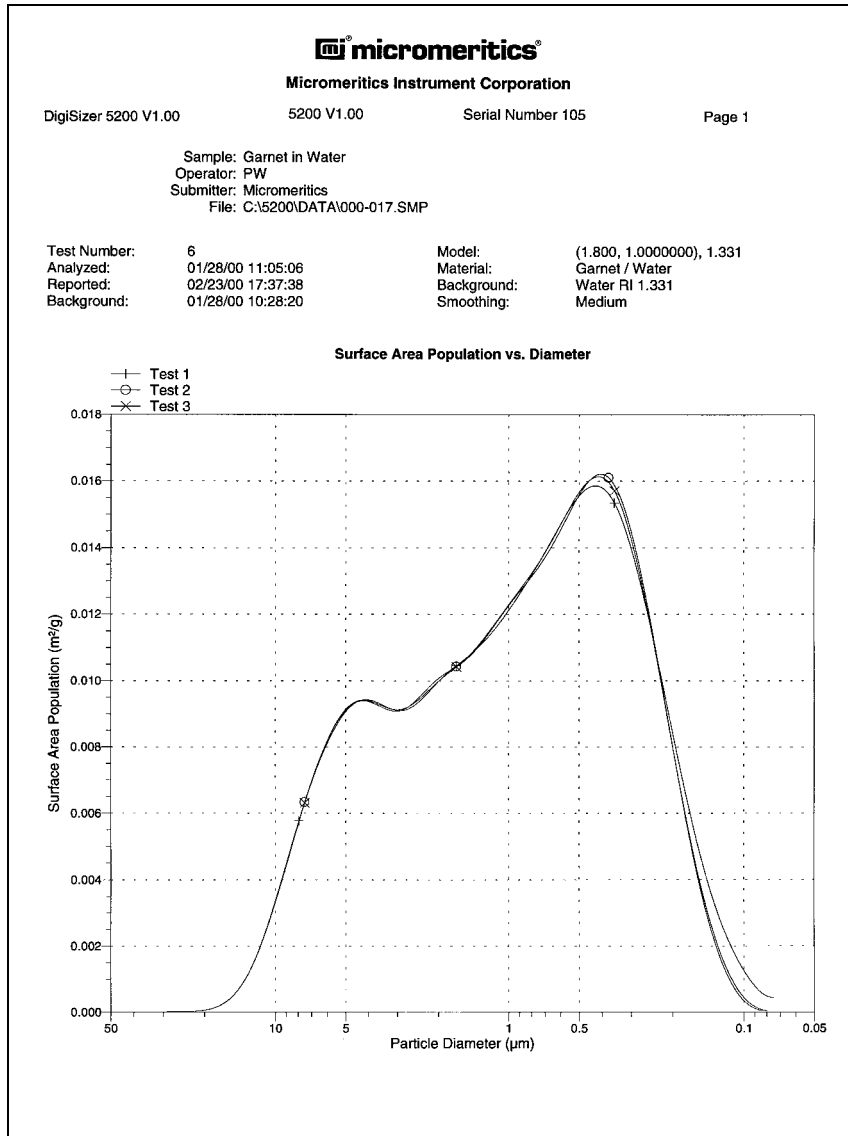
Varying symbols are used to differentiate the graphical lines and reported in a legend located just above the graph. If color output is available, different colors are used instead. Chapter 4 provides detailed instructions on generating overlays.



*This overlay shows the same type of curve from three sample files.*



*This overlay shows two different types of curves from the same sample file.*



*This overlay shows the same type of curve from all tests of the same sample file.*



## CHAPTER 8

### OPTIONS MENU

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- Description
- Service Test Mode
- Option Presentation
- Sample Defaults
- Data Presentation
- System Configuration
- Parameter Files Directory
- Model Management



## OPTIONS MENU

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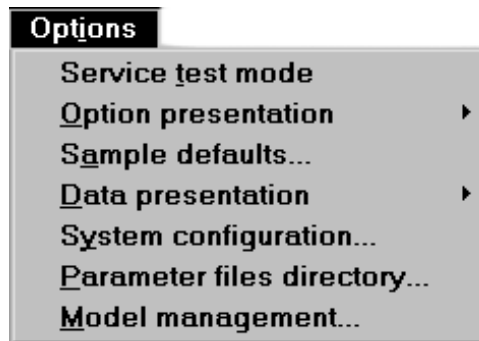
The Options menu contains commands that allow you to:

- Specify basic, restricted, or advanced mode
- Specify and edit sample file defaults
- Specify data presentation modes
- Specify printer/plotter options
- Specify your parameter files directory
- Install or remove models

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### Description

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Listed below are brief descriptions of the Options menu options. Detailed descriptions are found later in this chapter.

<b>Service Test Mode</b>	Enables you to perform certain troubleshooting procedures. This option is available only under the direction of a Micromeritics service representative.
<b>Option presentation</b>	Allows you to display the sample file dialog in the Basic, Advanced, or Restricted format.
<b>Sample defaults</b>	Allows you to specify defaults for the parameters contained in the sample information file.
<b>Data presentation</b>	Allows you to choose the way in which data are presented on the screen and in printed reports.

<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 the parameter files when using the Basic mode.
<b>Model management</b>	Allows you to selectively install or uninstall models.

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## Service Test Mode

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Various service tests are included in the Saturn operating program. These tests can be performed only with the assistance of a trained Micromeritics service representative. When you select **Service Test Mode** from the **Options** menu, a dialog box prompting you to enter a password is displayed. 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 perform these tests without their guidance. After Service Test Mode has been activated, the tests can be accessed from the **Unit** menu.

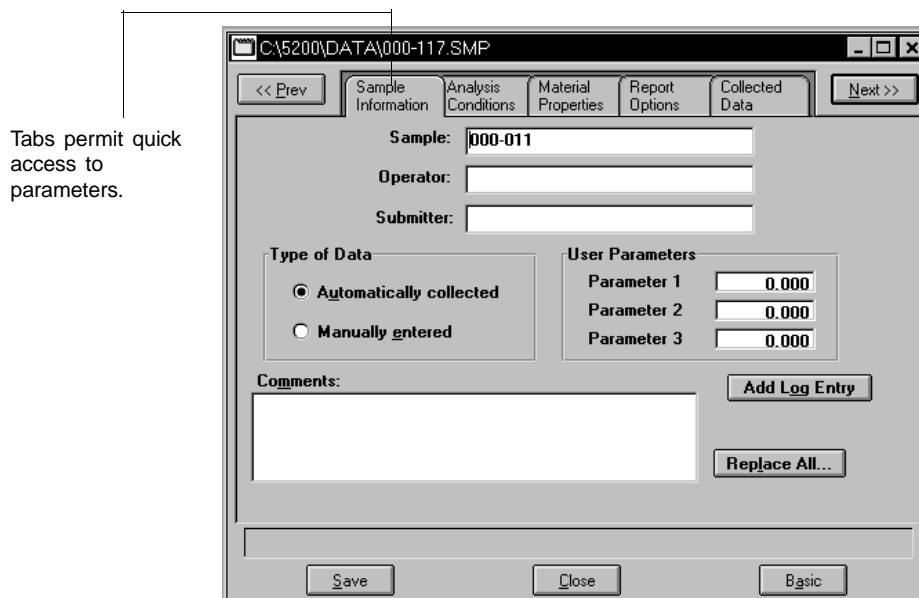
## Option Presentation

The sample editing dialogs for the Saturn DigiSizer analysis program may be presented in three modes: Restricted, Basic, or Advanced. Each format displays sample information and menu options differently.

- **Advanced:** displays all parts of the sample information file in a tabbed dialog like that of an index card file. You just click on the tab of the parameter you wish to edit. This format also allows you to switch to the Basic mode.
- **Basic:** displays all parts of the sample file as a single dialog. You select from predefined parameter files. This format also allows you to switch to the Advanced mode if editing of parameters is desired.
- **Restricted:** displays in the same manner as the Basic format. Certain menu options, however, become disabled and you cannot switch to the Advanced format. You must also enter a password to enter and exit this mode.

### Advanced

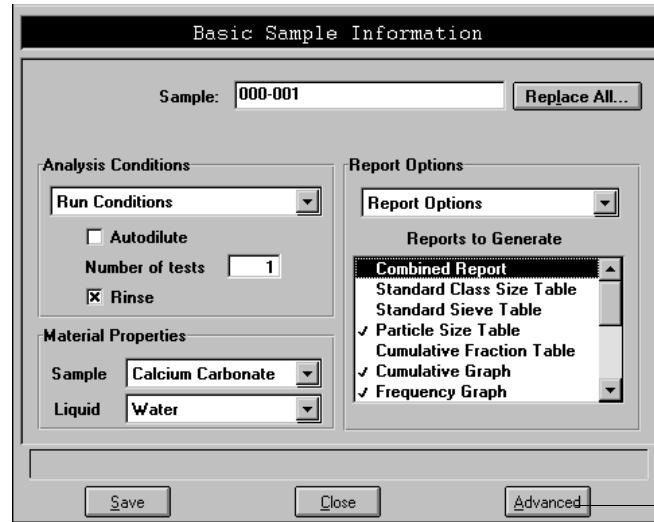
The **Advanced** format presents all parts of the sample information file in a tabbed dialog. Each tab opens its associated dialog.



The Advanced format can be used to edit sample parameters and customize files. Just click on the tab of the parameter you wish to edit, or use **Next>>** and **<< Prev** to move among the dialogs.

## Basic

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



The Basic format is used to create sample information files using previously defined analysis conditions and report options files. If editing is required, you can easily switch to the Advanced format 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 pharmaceutical laboratories.

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 use “password” to exit. 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.

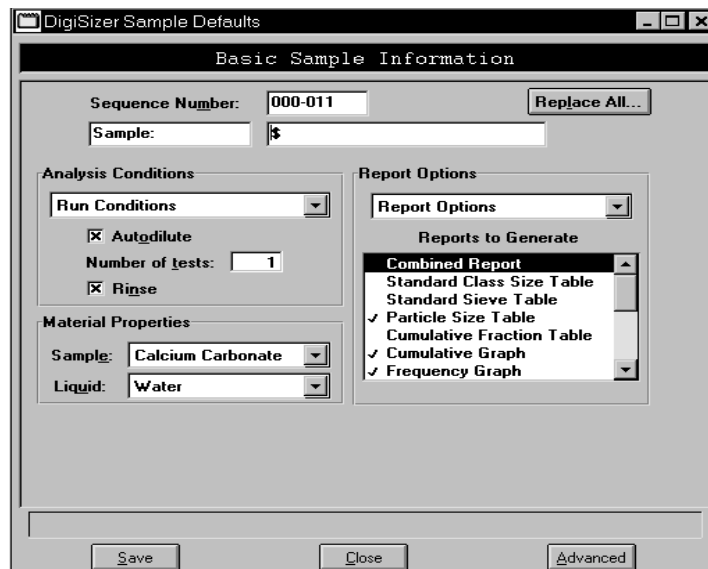
## Sample Defaults

This option allows you to specify default parameters for sample information files.

Sample defaults are the values you see in the sample information editors when you create a new sample file. For efficiency, it is best to specify defaults for materials you most commonly analyze. You can always edit the values in the sample file when it is created. Sample defaults can be created using the Basic or Advanced format.

### Basic

When you select **Sample defaults** while in the *Basic* format, the default Basic Sample Information dialog is displayed.



**Sequence Number:** Allows you to specify a default sequence for the sample file number. 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.
- » Do not use characters such as \* or ?.

## 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 number as part of the identification by using the \$ symbol where you want the sequence number to appear.

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

**Lab #25 - \$**

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

**Lab #25 - 000-001**

The sample identification for the second sample information file would be:

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

## Analysis Conditions group box

This group box contains a drop-down list containing predefined analysis conditions files; some of which were included with the software. Others are files that were created and saved to the directory specified as the parameter directory (explained later in this chapter).

Also included in this group box are the **Autodilute**, **Number of Tests**, and **Rinse** options.. Refer to Chapter 5 for additional information on these options.



**Material properties  
group box**

This group box contains two drop-down lists, one for **Sample** and one for **Liquid**. Samples and liquids can be added to the lists by switching to the Advanced format and using the Material Properties dialog.

**Report Options  
group box**

This group box contains a drop-down list containing report options files. Some report options files are included with the analysis program. To have report options files display in the list, they must be saved to the directory specified as the parameter directory (explained later in this chapter). The default parameter directory is PARAMS.

Also included in this group box is a list of available reports.

A rectangular button with a light gray background and a thin black border. The word "Save" is centered in the button in a black, sans-serif font.

Saves the specified defaults.

## Advanced

When you select **Sample defaults** while in the *Advanced* format, the DigiSizer Sample Defaults dialog is displayed.

**Sequence Number:** 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.
- » Do not use characters such as \* or ?.

**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.

**Sample:**  
(continued)

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 file identification by using the \$ symbol where you want the sequence number to appear.

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

**Lab #25 - \$**

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

**Lab #25 - 000-001**

The sample identification for the second sample information file would be:

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

**Operator:** These fields contain the name (or other identification)  
**Submitter:** of the operator and submitter.

In the fields on the left, you can change the names of the labels to read as something other than Operator and Submitter if desired.

In the fields on the right, enter the operator and submitter names (or other pertinent information) you wish to use as the defaults.

- » Include the automatically generated file number as part of the text entered in the fields on the right 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 prompts (fields on the left) is 20.
- » Maximum number of characters for the text in the fields on the right is 33, including the \$ symbol.
- » Omit either or both of these items entirely from the sample information file by selecting **Omit**.

**User Parameters  
Group Box**

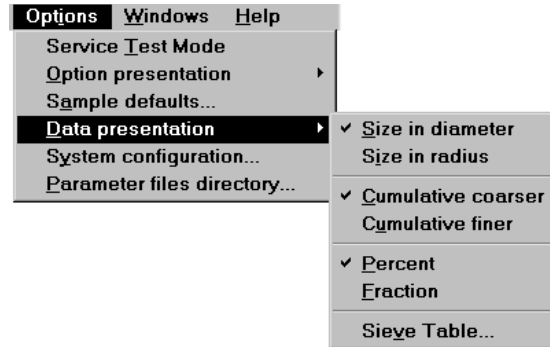
The fields in this group box are used specifically for SPC (Statistical Process Control) reporting. They are used to specify characteristics of either the sample or its manufacturing process.

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**.

## Data Presentaton

The options on the Data presentation drop-down menu allow you to specify how you wish tabular and graphical data to display on screen and in printed reports.

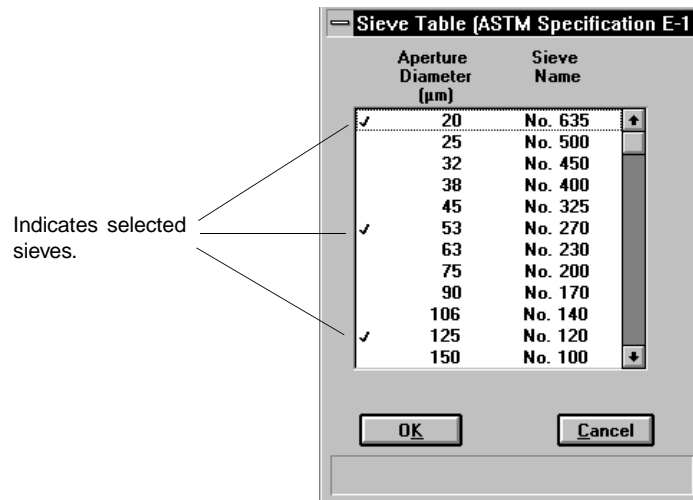


**Size in diameter**  
**Size in radius**  
**Cumulative coarser**  
**Cumulative finer**  
**Percent**  
**Fraction**

Allow you to choose how data are to display on the screen and in printed reports.

**Sieve Table**

Displays the Sieve Table dialog so that you can specify default sieve sizes when presenting sieve data.



A sieve size is selected when it is preceded by a check mark (✓).

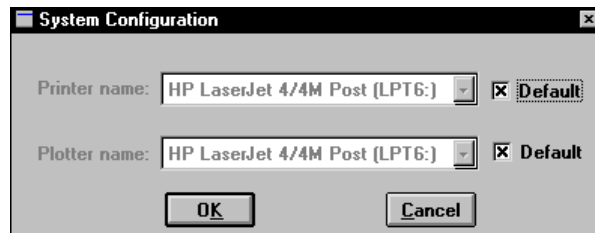
- » Make your selection(s) by double-clicking on the desired sieve(s), or highlight the desired sieve and press **Spacebar**.

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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 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.

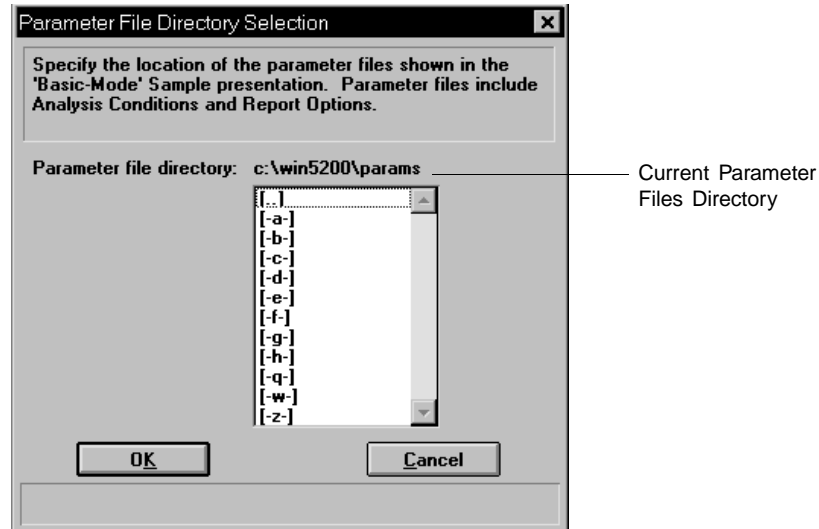
If you wish to change the default printer, de-select **Default**. Then choose another printer (or plotter) from the drop-down list of installed printers (plotters).

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## Parameter Files Directory

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This option allows you to specify a location for the predefined Analysis conditions, Report options, and Material properties files displayed in the drop-down lists on the Basic Sample Information dialog. The current directory is displayed above the drives/directory window.



The default directory is **Params** and includes several parameter files supplied with the DigiSizer 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 list(s).

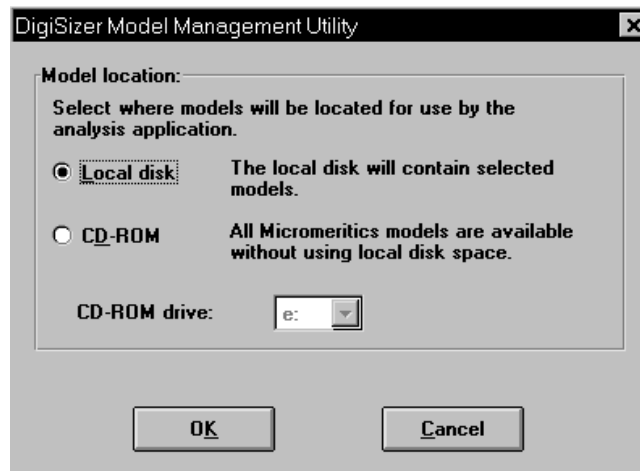
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## Model Management

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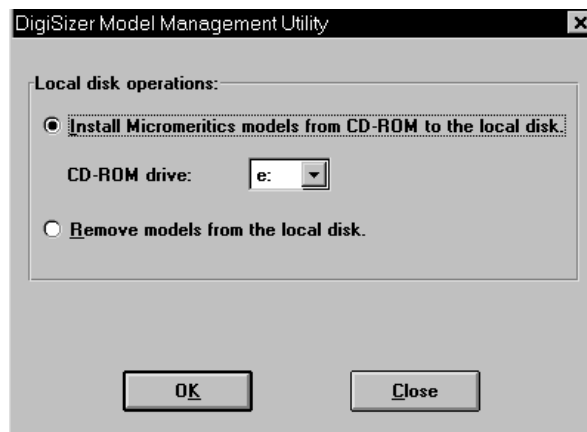
Models are collections of data detailing how light is scattered by particles of differing sizes made of a given substance in the liquid chosen to disperse them. Models are used to translate the measured light scattering pattern into a particle size distribution.

This option allows you to choose whether you wish to have the models accessed from the CDROM drive or to load them onto the computer.



### Local disk

Displays a dialog allowing you to install models or to remove previously installed models.

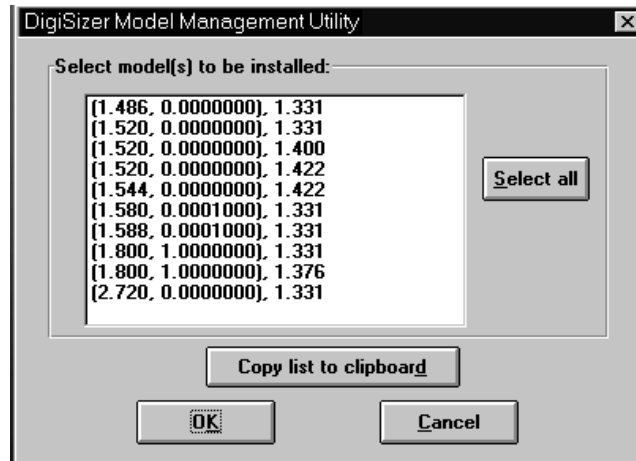


If you choose to install models, ensure that the correct drive designator is displayed for the CD-ROM drive; if not, use the drop-down list and navigate to the CD-ROM drive. Each model consumes approximately 1.2 MB of disk space.



## Local disk (continued)

Regardless of whether you choose to install or remove models, a dialog containing a list of models is displayed.



**Select all** allows you to select all models in the window. To install (or remove) specific models, simply select the desired model. To select multiple models, simply hold down **Ctrl** while making your selections.

**Copy list to clipboard** allows you to copy all selected models to the clipboard so that you can paste them into another application.

New models can be generated using the **Options** push button on the Materials properties dialog (refer to Chapter 5 for additional information).

## CD-ROM

Allows you to access the models from the CD-ROM drive so that you do not have to use disk space on your local drive. Use the drop-down list to select the drive designator for the CD-ROM drive.

If you choose to use this option, be sure that the CD-ROM is in the drive when the analysis program is in use.

## **CHAPTER 9**

# **TROUBLESHOOTING AND MAINTENANCE**

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- Troubleshooting
- Cleaning the Analyzer
- Cleaning the Optics
- Replacing the Tubing
- Replacing the Air Filter



## TROUBLESHOOTING AND MAINTENANCE

The Saturn DigiSizer 5200 system has been designed to provide efficient, continuous service and requires very little maintenance. The few maintenance procedures recommended are simple, easy to perform, and require no tools. If any service beyond the scope presented in this chapter is required, you should contact your local trained service representative. You should never at any time attempt to remove any panels from the analyzer.

### Troubleshooting

Most common operational problems are caused by improperly installed tubing, or a dirty sample cell. Always check these things first when expected analysis results are not obtained. Most operational problems are indicated by an error message on the monitor screen. Appendix A provides solutions for these messages. Listed below are some troubleshooting tips when operational problems occur.

*Table 9-1. Common Operational Problems*

Problem	Action
No power to the analyzer	Ensure that the power cord is firmly plugged into the analyzer and the receptacle.
	Ensure that the ON/OFF switch is in the ON position.
	Ensure that the power source is energized.
	Check the fuse located in the Corcom power entrance located on the rear panel of the analyzer; replace if necessary. (Refer to Chapter 2 for instructions on installing fuses.)
	Ensure that the line voltage is correct for the analyzer's configuration. (Refer to Chapter 2 for instructions on specifying line voltage.)
	Make sure the Linear circuit breaker has not tripped. If the breaker has tripped (indicator button is extended), turn off the analyzer and wait for a few minutes. Reset the breaker and turn on the analyzer.

Problem	Action
<p>No communication between the analyzer and the computer</p>	<p>Ensure that the communications cable for the analyzer and the computer are firmly plugged in.</p>
	<p>Ethernet board may be faulty. Contact Micromeritics to order a replacement board and reinstall. Reconfigure the board after reinstallation. Refer to Chapter 2 for instructions on installing and configuring the Ethernet board.</p>
<p>Time-out message during rinse or drain operation</p>	<p>Make sure the Analysis and/or Rinse containers contain liquid; if not; refill and resume operation.</p>
	<p>Check the rinse/analysis tubing to see if it is primed (fluid inside the tubing). If no fluid is present, inspect the tubing for a cut or worn spot; replace the tubing if necessary. Chapter 2 provides instructions for installing the tubing.</p>
	<p>Make sure a sample cell is installed. If a sample cell is not installed, the sample cell compartment will be filled with liquid. Remove the rubber mat from the sample cell compartment. Thoroughly dry the inside of the compartment and the mat. Replace the mat and install the sample cell using the procedure outlined in Chapter 2.</p>
	<p>Check the tubing connections to the sample cell to make sure they are secure. If leaking, cancel the current operation. Thoroughly dry the inside of the sample compartment and tighten the tubing connections, then resume operation.</p>
<p>Check the pumps and solenoid valves for proper operation. Access the instrument schematic and enable manual control. Turn the analysis and rinse pumps on to ensure that liquid is being pumped into the reservoir. Call your local Micromeritics representative if liquid does not pump into the reservoir properly.</p>	

Problem	Action
<b>MASTERTECH</b>	
No power to the MasterTech	Ensure that the power cable is plugged securely into the power source.
	Ensure that the ON/OFF switch is in the ON position.
	Check the fuse located in the Corcom power entrance located on the rear panel of the MasterTech; replace if necessary. (Refer to Chapter 2 for instructions on installing fuses.)
Stirrer will not work.	Ensure that the stirrer is properly connected.
Turntable will not move.	Press the arm AUTO/LOAD switch on the front panel to place it in the AUTO position.
MasterTech pump will not run.	Ensure that the pump AUTO/OFF switch on the front panel is in the AUTO position.
	Tubing may be bunched up in the pump; pull the tubing taut.
Ultrasonic probe will not work.	Check the BNC connector cable to ensure that it is properly connected.
Ultrasonic agitation diminished.	Check the probe tip; replace if necessary.
MasterTech will not initiate commands from the computer.	Check the cable connection from the MasterTech to the computer to ensure that it is properly connected.
Pump leaks or is not operating efficiently.	Tubing is leaking or clogged; replace tubing.

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## 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 and liquid sample handler. It is not necessary to remove any control knobs or screws while cleaning. If you have a MasterTech installed on your Saturn DigiSizer, it may be cleaned in the same manner.

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## Cleaning the Optics

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The accessible optics of the DigiSizer 5200 consist of three components: the sample cell, the detector lens, and the collimator lens. It is important that these components be kept clean.

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### Sample Cell and Detector Lens

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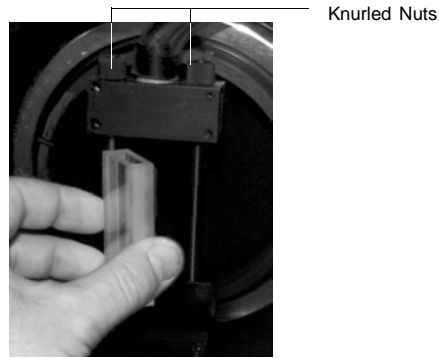
The sample cell should be cleaned as needed based on changes in background intensity (refer to Appendix J for a discussion on background quality). You will need the following items to clean the sample cell (included in the accessories kit):

- Lens cleaner
  - Lens paper
  - Soft absorbent (non-scratching) foam swab
1. Select **Drain** from the **Unit** menu to drain the system of all liquid and to move the rotation arm out of the way, allowing easy access to the sample cell assembly. The dialog will close when draining is complete.
  2. Open the front panel of the DigiSizer analyzer and remove the cover of the analysis compartment.
  3. Loosen the two knurled nuts on the top bracket of the sample cell holder; then pull up on the bracket to allow removal of the sample cell.



**The sample cell is coated with an anti-reflective substance. Be careful not to scratch or abrade this coating. Also avoid touching the front and back surfaces of the sample cell to prevent fingerprints.**

4. Rotate the cell out of its holder by pulling the right-hand side of the cell assembly toward the front of the analyzer. The left side will remain against the vertical support.

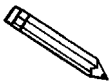


5. Grasp the sample cell by its side edges and place on a sheet of lens paper while performing the next two steps.
6. Using your fingertip, check the o-rings in the upper and lower bracket of the sample cell holder to ensure that they are clean (no grit is present) and properly seated. If the o-rings appear dirty, wipe them with a sheet of lens paper dampened with lens cleaner.
7. Using a flashlight or other type of illumination, examine the detector lens (located at the back of the analysis compartment). If particles or smudges are evident, gently clean the lens surface with a sheet of lens paper dampened with lens cleaner. Then, using a dry sheet of lens paper, gently wipe the surface dry.



**The detector lens is coated with an anti-reflective substance. Be careful not to scratch this coating. Also avoid touching the surface of the lens to prevent fingerprints.**

8. Holding the sample cell by its side edges, blow or gently brush away any debris from the surface of the sample cell.
9. Using a sheet of lens paper dampened with lens cleaner, clean the upper and lower edges of the cell. Then, using a foam swab dampened with lens cleaner, clean the outside and inside of the cell.



**Always hold the sample cell by the side edges. Fingerprints on the front and back surfaces of the cell can alter analysis results.**

10. Using a dry sheet of lens paper, gently and completely wipe dry the *outside* of the cell; **DO NOT** dry the inside of the cell.



11. Reinstall the cell:
  - a. Orient the cell so that the groove is on the left side and the extended flange is on the front of the right side.
  - b. Slide the grooved (left side) of the cell onto the left vertical bar.



**Top View of Sample Cell Seated Against Left and Right Vertical Bars**

- c. Rotate the sample cell toward the right vertical bar; ensure that the cell is seated properly between the two vertical bars.
  - d. Slide the top bracket of the sample cell holder down; tighten the knurled nuts. You should see a black oval on the bottom of the cell where the o-ring makes a seal.
12. Perform a quick leak-check to ensure proper installation of the cell:
  - a. Select **Rinse, DigiSizer** from the **Unit** menu.
  - b. Choose the **Rinses** option, specify **1**, and then click  .
  - c. Observe the sample cell. If no leaks occur, proceed to Step 13. If leaks occur, click  , then  to stop the rinsing function.
  - d. Close the front panel (you do not have to reattach the cover of the sample analysis compartment); then select **Drain** from the **Unit** menu to drain the system.
  - e. After draining is complete, turn off the analyzer, then close the analysis program.
  - f. Open the front panel and remove the rubber mat from the analysis compartment.
  - g. Wipe dry the area around the sample cell, the mat, and the analysis compartment; replace the mat.
  - h. Make sure the cell is seated properly and the knurled nuts are secure.
  - i. Turn on the analyzer and start the analysis program.
  - j. Repeat steps a, b, and c (and the remainder if necessary).
13. Replace the sample cell compartment cover and close the front panel.

## Collimator Lens

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The collimator lens should not require cleaning unless the Saturn DigiSizer is being exposed to an environment where high levels of dust are present. If this is the case, you should occasionally inspect the collimator lens and the analysis compartment to ensure their cleanliness. You should always keep the analysis compartment and the analyzer's front cover closed except during cleaning to minimize dust build-up.

You will need the following items to clean the collimator lens:

- Small mirror
  - Lens paper
1. Select **Drain** from the **Unit** menu to drain the system of all liquid and to move the rotation arm up. The dialog will close when draining is complete.
  2. Open the front panel of the DigiSizer analyzer and remove the cover of the analysis compartment.
  3. Wipe or brush the inside of the analysis compartment if needed.
  4. Use the mirror to locate the collimator lens (on the underside of the rotation arm).
  5. Using a sheet of dry lens paper, gently wipe the surface of the lens. Be careful not to touch the lens with your fingertips. Do not use compressed air to blow away particles from the detector lens. This merely resuspends the particles, allowing them to resettle on the optics.
  6. Replace the sample cell compartment cover and close the front panel.

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## Cleaning the Sample Reservoir

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Rinsing after analysis generally will keep the reservoir in a clean state. Occasionally, however, particles may accumulate on the surface of the reservoir where rinsing may not sufficiently remove them. If the reservoir appears dirty or feels gritty to the touch, clean it as follows:

1. Select **Drain** from the **Unit [n]** menu to empty the reservoir of all liquid.
2. Using a clean, soft cloth, wipe the inside of the reservoir. If necessary, use a soft brush to remove any stubborn particles.
3. Perform a rinse operation to rinse the reservoir; this operation also fills the reservoir to the primed level.

## Replacing the Tubing

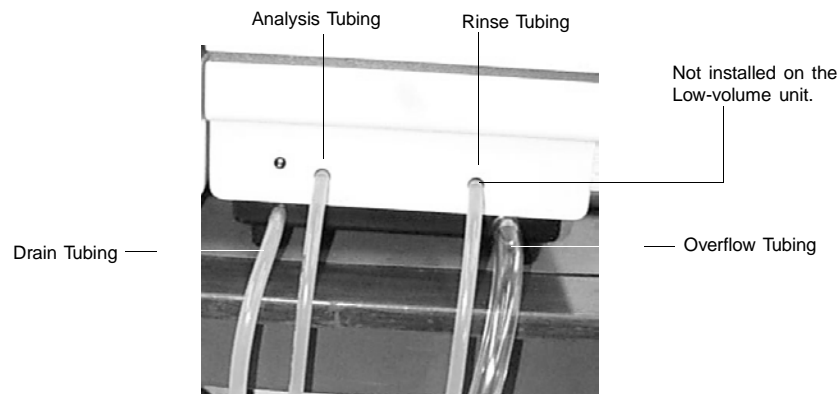
Tubing may occasionally become worn or damaged in some way and require replacing.

### Liquid Sample Handler

The types of tubing connected to the liquid sample handler are identified as follows:

- Rinse tubing\*                      0.64-cm (1/4-in.) diameter
- Analysis tubing                    0.64-cm (1/4-in.) diameter
- Overflow tubing                    1.27-cm (1/2-in.) diameter
- Drain tubing                        0.79-cm (5/16-in.) diameter

\*The Low-volume unit uses the same liquid for analysis and rinsing. Therefore, Rinse tubing is not installed. Ignore all references to the rinse tubing in this procedure if you have the Low-volume unit.



The tubing on the liquid sample handler should be replaced as needed. Refer to Chapter 10 for part numbers and ordering information. All tubing is removed and replaced in the same manner. The rinse and analysis tubing are the same type tubing. The drain tubing is the same color and very close to the same size as the rinse and analysis tubing; be sure that you are replacing the damaged tubing with the correct tubing.

1. Slide the damaged tubing off the connector on the front panel of the liquid sample handler.
2. Remove the other end from its liquid container. If you are removing the analysis or rinse liquid tubing, be sure to remove the weights; place aside for installation on the replacement tubing.

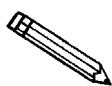
3. Slide one end of the replacement tubing onto its appropriate connector on the front panel.
4. Insert the other end of the tubing into its appropriate liquid container. Be sure to reinstall the weights if replacing the analysis or rinse tubing.

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## Replacing the Air Filter

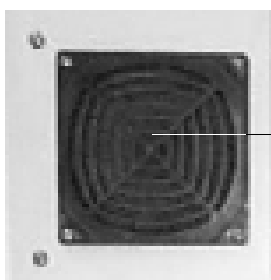
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The air filter should be replaced every 30 days (more often in environments with increased levels of dust).



**A supply of air filters is provided in the accessories shipped with your instrument. Refer to Ordering Information in Chapter 10 when reordering is required.**

1. Remove the filter by inserting a pointed object, such as a flat-head screwdriver, into the center portion of the retaining cover; then pop off the cover.



Insert screw driver here.

2. Discard the old filter and replace with a new one from your accessories kit.
3. Replace the retainer cover.

## **CHAPTER 10**

### **ORDERING INFORMATION**

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## ORDERING INFORMATION

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Components and accessories for the Saturn DigiSizer 5200 system can be ordered by:

- contacting our Customer Service Department at 770/662-3636
- accessing our web site at <http://www.micromeritics.com>

When ordering, please use the information provided below.

Part Number	Description
520-00000-00	Saturn DigiSizer system; includes analyzer, automatic liquid sample handler, software, and operator's manual
052-00052-00	MasterTech 052, for automatic sample preparation. Redisperses up to 18 samples and transfers them to the DigiSizer for analysis.
520-33002-00	Current version of software and operator's manual; for manipulation of data offline on a computer other than the one controlling the analyzer
004-32065-00	Lens paper, pkg. of 50
004-38600-00	Lens cleaner
004-35152-00	Foam swab, pkg. of 50
004-27015-00	Air filter (rear panel), package of 10
520-42801-00	Operator's manual
003-51134-00	Fuse, 3AG, Slow-Blow, 5 Amp
003-51198-00	Fuse, 5 x 20 mm, Slow-Blow, 3.15 Amp
003-51132-00	Fuse, 3AG, Slow-Blow, 3 Amp
003-51207-00	Fuse, 5 x 20 mm, Slow-Blow, 1.6 Amp
520-61701-00	Sample cell
004-25575-01	O-ring, for sample cell, Viton <sup>®</sup>
520-32802-00	Gasket (spacer), light blocking, for tubing orifices on liquid sample handler
004-16841-00	Reference material, Garnet, 5.30 $\mu$ m



Part Number	Description
520-32803-04	Tubing, flexible, for lower sample cell port (standard liquid sample handler)
520-32803-05	Tubing, flexible, for upper sample cell port (standard liquid sample handler)
520-32804-07	Tubing, flexible, for lower sample cell port (low-volume liquid sample handler)
520-32804-04	Tubing, flexible, for upper sample cell port (low-volume liquid sample handler)
520-33008-00	Microvolume Option; allows sample analysis using small amounts of dispersant (approximately 7 mL)
<b>————— MASTERTECH ACCESSORIES —————</b>	
051-61702-00	Beaker, tall form polyethylene; recommended for quieter operation
051-14811-00	Evaporation cover
051-14814-00	Turntable assembly
051-32902-00	Tubing set, silicone
051-32901-00	Tubing set, Tygon <sup>®</sup> , pre-cut
051-32903-00	Tubing, PharMed <sup>®</sup> , pre-cut
051-58605-02	Ultrasonic probe tip, 1/8 in.
052-58605-02	Ultrasonic probe tip, 1/4 in.

## **APPENDIX A**

### **ERROR MESSAGES**

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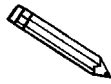
## ERROR MESSAGES

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Two types of error messages may be encountered while operating the Saturn DigiSizer program:

- Numbered error messages: displayed during operational procedures
- Unnumbered error messages: displayed on the instrument schematic

If the Action response for either type of message instructs you to contact your service representative, record the error message and make backup copies (if appropriate) of any files involved in the operation.



**The 1000 series error messages are used for software testing and are not included in this appendix. These errors should not occur during normal operation. If you receive a 1000 series error message, contact your service representative after making backup copies of any files involved in the operation.**

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### Numbered Messages

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#### **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 operation using a backup copy of the file.

*Cause B:* Hard disk may be damaged.

*Action B:* Contact your service representative.

*Cause C:* A software error occurred when the file was accessed.

*Action C:* Contact your service representative.

*Cause D:* The name specified contains one or more invalid characters.

*Action D:* Enter a valid filename; 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 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 Saturn DigiSizer files (sample information, analysis conditions, material properties, or report options) have been added to this directory by some function other than the Saturn DigiSizer program.

*Action:* Select **Yes** to update the directory information with data from each new file. This operation may take a minute.

Select **No** if you do not want to spend the time updating the directory information. This option may be feasible if a large number of files have been copied into the directory and you know the name of the file you wish to access.

**2434- File (file name) — Subset # (number) wrote wrong amount of data.**

*Cause:* An internal processing and/or hardware error has occurred.

*Action:* Contact your service representative if you continue to receive this error message.

**2436- Path specification (path name) is invalid.**

*Cause:* You entered an invalid path name and/or extension.

*Action:* Type a valid path name (including the proper extension) and press  .

**2437- File (file name) does not exist.**

*Cause:* You entered an invalid file name.

*Action:* Enter the name of an existing file 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 disk in the disk drive is not write-protected.

**2439- Could not register file.****2440- Subset not found.****2441- Seek within file failed.****2442- Had header in subset file.****2443- Subset owner denied access.****2444- Not a valid file format.****2445- Subset wrote the wrong amount of data.****2446- Error reading data.****2447- Error writing data.**

*Cause:* An unexpected error occurred when you tried to access a data file.

*Action:* Contact your service representative.

**2448- File directory (path name) is invalid. Resetting to the installation directory.**

*Cause:* A working directory specified in the .INI file is invalid. The directory may have been deleted or moved to a different location.

*Action:* The installation directory will be substituted. The next time you open a file, use the **Directories:** list to move to the correct directory.

**2449- This field does not contain a valid file specification.**

*Cause:* You entered an invalid file name.

*Action:* See the description of file naming conventions in your DOS or Windows manual and reenter the name.

**2458- An instrument is performing a critical operation. Wait a few moments before exiting the application.**

*Cause:* You are attempting to exit the application while the analyzer is performing a critical operation. This operation must be completed before the application can be exited.

*Action:* Wait a short time and attempt to exit the application again.

**2459- An instrument is busy. Continue with program Exit? (Yes, No)**

*Cause:* You are attempting to exit the application while an analysis is in progress. While this is possible, the data collected while the application is inactive will not be permanently recorded until the application is restarted. A power failure to the instrument could cause some data to be lost.

*Action:* If you are not concerned with the potential for loss of data should a power failure occur, select **Yes** to continue; otherwise select **No**.

**2460- Fatal Communications error on (Unit n - S/N: nnnn)**

*Cause:* There was a fatal error in the serial communications between the application and the analyzer. All displays for that analyzer will be closed.

*Action:* Check that the analyzer is connected to the computer on the communications port configured in the Setup program. Exit the analysis program and then restart it. If this error persists, contact your service representative.

**2461- No active instruments. Application will stop.**

*Cause:* At least one instrument must be active for the application to operate. The initialization of all of the instruments configured with the Setup program has failed. The application stops.

*Action A:* Usually this message is preceded by another message giving the reason for the instrument's failure to initialize. See the instructions for that message.

*Action B:* Check the cable connection between the analyzer and the computer. Verify that the instrument has the power switch in the ON position and that the light on the front panel is illuminated. If the application continues to fail in its attempts to initialize the instrument, contact your service representative.

**2468- The instrument contains an unknown software version. Do you want to reset it?**

*Cause:* The application has discovered a different version of software operating in the instrument.

*Action:* If there is no chance that an instrument other than the Saturn DigiSizer is connected to the computer, select **Yes** to reset the instrument and download the proper software. Otherwise, select **No** to leave the instrument unchanged.

**2469- The instrument software did not initialize properly on Unit n - S/N: nnnn.**

*Cause:* The Saturn DigiSizer software failed to execute properly.

*Action:* Reinstall the software, then restart it. If the problem persists, contact your service representative.

**2470- Unable to read instrument software file for Unit n - S/N: nnnn.**

*Cause:* The application tried to read the instrument software file to download it to the instrument. It was unable to do so.

*Action:* Reinstall the Saturn DigiSizer software, then restart it.



**2477- Unit n - S/N: nnnn did not properly initialize.**

*Cause:* The software was unable to initialize this instrument; this is usually caused by one of the conditions listed in the error messages above.

*Action:* Correct the problem as described above, then restart the application.

**2486- Could not construct (name) report type. Program will terminate.**

*Cause:* An internal processing and/or hardware error has occurred.

*Action:* Contact your service representative if you continue to receive this error message.

**2487- Could not start report generator. Error code (number). Program will terminate.**

*Cause:* An internal processing and/or hardware error has occurred.

*Action:* Contact your 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 already open for editing.

*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:* Run the Saturn DigiSizer Setup program (located on the applications CD), select **Change the number of units** and enter the pertinent information.

**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:* The number you entered in the highlighted field is invalid.

*Action:* Check the entry and enter or select a valid number.

**2497- This field contains an invalid character.**

*Cause:* You entered an invalid character in the highlighted field.

*Action:* Check the entry and enter valid characters.

**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 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 specified file 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 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.

**2505- Error Logger cannot be initialized!! Error code (number). Program will exit.**

*Cause:* An internal processing and/or hardware error has occurred.

*Action:* Contact your service representative.

**2506- (sample file) Output device (name) is not installed. Printing cannot be accomplished.**

*Cause:* The selected output device is not installed.

*Action:* Select a different output device in the System Configuration dialog box. Install the device using the Control Panel, Printers operation.

**2507- 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.

**2508- (sample file) Overlay file (name) was not found. It will not be included in the reports.**

*Cause:* The specified overlay file could not be found.

*Action:* Ensure that the file specified as an overlay does exist.

**2509- (sample file) Error opening file (name): (error). Reports cannot be produced.**

*Cause:* An error occurred while the program was opening a file necessary to the report operation.

*Action:* Use the name given in the error message to investigate. Contact your service representative if you continue to receive this error message.

**2510- (sample file) Error parsing reports from file (name). Reports cannot be produced.**

*Cause A:* One or more data entry fields in the sample file may contain an invalid character (such as a single quote or double quotes).

*Action A:* Review the data entry fields (for example, the Sample field) and remove the invalid character.

*Cause B:* The system was unable to create the usual temporary files during the report, possibly due to insufficient disk space.

*Action B:* Check the space available on the hard disk.

*Cause C:* An internal processing error occurred.

*Action C:* Contact your service representative.

**2511- Print job (name) has been 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 five megabytes of free space for normal operation.

**2512- Print job (name) has been canceled.**

*Cause:* The requested print job was canceled at your request.

*Action:* None required.

**2521- Unable to program controller.**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**2522- Invalid controller application file.**

*Cause:* The application's control file has been corrupted or deleted.

*Action:* Reinstall the DigiSizer analysis program.

**2523- Programming controller failed.****2524- CRC check failed on programming controller.****2525- Unknown error programming controller.**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**2526- Controller download was not successful.**

*Cause:* A communications problem between the computer and the analyzer has occurred.

*Action A:* Check the cable connection between the computer and the analyzer.

*Action B:* Access the Unit configuration dialog from the Unit menu and verify that the TCP/IP configuration for the computer and the analyzer are correct.

*Action C:* Exit the Saturn DigiSizer application, and turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

**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:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**2532- The instrument contains an unknown software version. Do you want to reset it?**

*Cause:* The application has discovered a different version of software operating in the instrument.

*Action:* If there is no chance that an instrument other than the Saturn DigiSizer is connected to the computer, select **Yes** to reset the instrument and download the proper software. Otherwise, select **No** to leave the instrument unchanged.

**2533- Mass initialization failed.**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics service representative.

**4200- An error occurred while loading the application control information. Data entry cannot be performed. (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 internal error occurred while read control information was being read from a disk file.

*Action B:* 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** list box. No output could be produced.

*Action:* Ensure that at least one report is selected for the sample and reinitiate the report.

**4202- No valid data to report.**

*Cause:* The sample file you selected for reporting does not contain any valid data.

*Action:* If the sample is still analyzing, wait until enough data are collected to allow reporting. If the sample file has a **Complete** status, an error or operator intervention stopped the analysis before sufficient data were 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:* Select a reference file containing valid data.



**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:* Select a file containing valid data.

**4205- Finer 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 finer specification file is invalid.

*Action:* Select a file containing valid data.

**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:* You selected a test in the sample file that does not contain valid data.

*Action A:* If the sample is still analyzing, wait until enough data are collected to allow reporting.

*Action B:* Choose another test on which to report. If the sample file has a **Complete** status, an error or operator intervention stopped the analysis before sufficient data were collected. The analysis may be deleted from the file.

**4208- An overlay file is not valid. It was not included in the report.**

*Cause:* You selected a sample file for overly that contains invalid data.

*Action:* On the Report Options dialog, click **Overlays** and remove the file and choose one containing valid data.

**4209- The reference file is not valid. The report was not produced.**

*Cause:* You selected the **Difference from Reference** report; it cannot be computed because the reference file is invalid.

*Action:* You sselected a file for reference that contains invalid data; choose a different file.

**4210- Coarser specification file is not valid. The report was not produced.**

*Cause:* You selected the **Out of Specification** report; it cannot be computed because the coarse specification file is invalid.

*Action:* You sselected a file that contains invalid data; choose a different file.

**4211- Finer specification file is not valid. The report was not produced.**

*Cause:* You selected the **Out of Specification** report; it cannot be computed because the finer specification file is invalid.

*Action:* You selected a file that contains invalid data; choose a different file.

**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** list box. No output could be produced.

*Action:* Ensure that at least one report is selected for the sample and rein-  
itiate the report.

**4213- Are you sure you want to delete the test?**

*Cause:* You clicked **Delete** on the Collected Data dialog to delete a test.

*Action:* Click **Yes** to remove the indicated test from the sample file; click **No** to allow the test to remain in the file.

**6003- New data reduction options are currently being applied to the test data. Do you wish to cancel the reprocessing?**

*Cause:* You have requested to cancel the reprocessing of the intensity data.

*Action:* Select **Yes** to cancel the reprocessing. Select **No** to continue the reprocessing.

**6004- All of the test data will be converted to the new data reduction options. Do you wish to continue?**

*Cause:* You requested Scattering Model Advanced Options to be applied to collected data.

*Action:* Select **Yes** to convert the data to the new data reduction options, and **No** to stop the reprocessing.

**6005- Model generation is already in progress. Only one generation is allowed at a time.**

*Cause:* You requested that a new scattering model be generated, but one is currently being generated.

*Action:* Wait for the current model to complete its generation process and then try again.

**6006- Application of new data reduction options to <file name> is complete.**

*Cause:* You requested Scattering Model Advanced Options to be applied to collected data and the process is now complete.

*Action:* None required; notification message only.

**6007- A new model generation cannot be started. One is already in progress.**

*Cause:* You requested that a new scattering model be generated, but one is currently being generated.

*Action:* Wait for the current model to complete its generation process and then try again.

- 6008-** Error loading the model generation task. Error code: <number>  
**6009-** An error occurred while converting <file name> to a new model. All further processing aborted.  
**6010-** An unusual condition occurred while converting <file name> to a new model. Processing will continue.

*Cause:* An error occurred while generating the model, probably due to a problem with the background generation application.

*Action:* Reinstall the software and try again.

**6014- The sample has an invalid status and cannot be used for this analysis.**

*Cause A:* You chose a sample file that has no tests remaining for analysis.

*Action A:* Choose a sample file with a status of **No Analysis** or **Complete**. Eight tests can be performed using one sample file. Refer to Chapter 3 for clarification on file status.

*Cause B:* You chose a sample file that is currently in an analyzing or calculations state.

*Action B:* Watch the status window and proceed when the status window indicates analysis and/or calculations are complete.

**6015- The liquid selected for the analysis does not match the background.**

*Cause:* You attempted to begin an analysis, but the analysis liquid specified in the sample file did not match that of the current background.

*Action A:* Measure a new background with the proper liquid and continue with analysis.

*Action B:* Choose a sample file that matches the dispersing liquid of the current sample and background.

**6016- Warning, the instrument is not calibrated.**

*Cause:* You attempted to begin an analysis, but the instrument is not fully calibrated.

*Action A:* Exit the analysis program and turn off the analyzer. Turn the analyzer back on and restart the analysis program. Select **Unit configuration** from the **Unit [n]** menu to verify that calibrations are installed (calibration items will contain dates). If no information displays for the calibration items, go to Action B.

*Action B:* Run the setup application and reinstall the calibration files. Refer to Subsequent Installation in Chapter 2.

**6017- Error accessing the sample information file <name>.**

*Cause:* An unexplained error prevents you from accessing this file.

*Action:* The hard disk drive may be corrupt. Run diagnostics.

**6018- File <file name> already has all its tests filled.**

*Cause:* You tried to insert a new test using a sample file 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.

**6020- File <file name> cannot be analyzed. It is currently being edited.**

*Cause:* You selected a file that was still open in an editing window for analysis.

*Action:* Finish the changes to the sample file, then save and close the editing window.

**6021- An analysis cannot be performed on <file name>. It is open for editing and contains errors.**

*Cause:* You selected a file that 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.

**6022- The edit session for <file name> must be saved before the analysis. Save changes and continue with the analysis?**

*Cause:* You selected a file for analysis that is currently being edited. The changes to this file must be saved before it can be used in an 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.

**6023- An error occurred while loading the scattering models. Data reduction cannot be performed.**

*Cause:* The application was unable to load the scattering models properly.

*Action:* Select **Model management** from the **Options** menu and reinstall the models.

**6024- 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 cannot be edited while this mode is active.

*Action:* End all automatic analysis modes on all attached units and try again.

**6025- Unable to find optical model <file name>.**

*Cause:* The model used by the sample could not be loaded.

*Action A:* If you selected to use models from the CD-ROM drive rather than install them on your local drive, be sure that the CD is in the CD-ROM drive.

*Action B:* Select the **Options** push button on the Materials Properties dialog and make sure the selected model exists.

*Action C:* Select **Model management** from the **Options** menu and reinstall the models.

**6026- The angles of the optical <file name> do not match the collected data.**

**6027- The size classes of the optical model <file name> do not match the standard size classes.**

**6028- Cannot read the deconvolution results.**

**6029- Cannot execute the deconvolution application.**

*Cause:* An error occurred during deconvolution of the model, probably due to a problem with the background calculation application.

*Action:* Reinstall the software and try again.

**6041- Unable to download DSP application.**

**6042- Unable to download DSP initialization data.**

**6043- Unable to download controller initialization data.**

*Cause:* A communications problem between the computer and the analyzer has occurred.

*Action A:* Check the cable connection between the computer and the analyzer.

*Action B:* Access the Unit configuration dialog from the Unit menu and verify that the TCP/IP configuration for the computer and the analyzer are correct.

*Action C:* Exit the Saturn DigiSizer application, and turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micomeritics representative.

**6044- DSP application file not found.**

*Cause:* The application's control file has been corrupted or deleted.

*Action:* Reinstall the Saturn DigiSizer analysis program.

**6045- DSP initialization data not found.****6046- Controller initialization data not found.**

*Cause A:* The application's control file has been corrupted or deleted.

*Action A:* Reinstall the Saturn DigiSizer analysis program.

*Cause B:* The instrument serial number is incorrect.

*Action B:* Reinstall the Saturn DigiSizer analysis program and calibration files.

**6047- DSP application packet number error.**

*Cause:* A communications problem between the computer and the analyzer has occurred.

*Action A:* Check the cable connection between the computer and the analyzer.

*Action B:* Access the Unit configuration dialog from the Unit menu and verify that the TCP/IP configuration for the computer and the analyzer are correct.

*Action C:* Exit the Saturn DigiSizer application, and turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

**6048- DSP illegal message number error.****6049- DSP checksum error.**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.



**6050- DSP incomplete application error.**

- Cause:* A communications problem between the computer and the analyzer has occurred.
- Action A:* Check the cable connection between the computer and the analyzer.
- Action B:* Access the Unit configuration dialog from the Unit menu and verify that the TCP/IP configuration for the computer and the analyzer are correct.
- Action C:* Exit the Saturn DigiSizer application, and turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

**6051- DSP not responding error.**

- Cause:* A hardware malfunction has occurred.
- Action:* Contact your local Micromeritics representative.

**6052- Unknown DSP download error.****6053- Error downloading DSP initialization data.****6054- Unknown error downloading DSP initialization data.**

- Cause:* A communications problem between the computer and the analyzer has occurred.
- Action A:* Check the cable connection between the computer and the analyzer.
- Action B:* Access the Unit configuration dialog from the Unit menu and verify that the TCP/IP configuration for the computer and the analyzer are correct.
- Action C:* Exit the Saturn DigiSizer application, and turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

**6056- Unable to establish the TCP connection with the instrument.**

*Cause:* A communications problem between the computer and the analyzer has occurred.

*Action A:* Check the cable connection between the computer and the analyzer.

*Action B:* Access the Unit configuration dialog from the Unit menu and verify that the TCP/IP configuration for the computer and the analyzer are correct.

*Action C:* Exit the Saturn DigiSizer application, and turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

**6058- Unrecognized sample handler.**

*Cause:* A communications problem between the analyzer and liquid sample handler has occurred.

*Action A:* Check the cable connection between the analyzer and the liquid sample handler.

*Action B:* Exit the Saturn DigiSizer application; turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

**6059- DSP application failed to execute.****6060- Invalid laser parameters****6063- DSP: Wrong init result (Result: X)****6064- DSP: Write timeout (Message: X, Byte/Word:X)****6065- DSP: Read timeout (Message: X, Byte/Word: X)****6066- DSP: Invalid message size (X).****6067- DSP: Unexpected message ID (Expected: X, Received: X)****6068- DSP: Wrong packet number (ID: X, Expected: X, Received: X)**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**6069- Detector: Laser interlock disabled.**

*Cause:* The analyzer's front panel is not closed properly.

*Action:* Be sure the front panel is closed completely. If problem persists, contact your local Micromeritics representative.

**6070- Detector: DAC timeout (type: X)**

**6071- Detector: Exposure timeout (status: X, delay: X sec)**

**6072- Detector: ADC busy (type: X, status: X)**

**6073- Detector: ADC out of range (type: X, LD: X, BT: X)**

**6074- Detector: Timeout on waiting for pixel buffer.**

**6075- Detector: Pixel buffer X is not ready.**

**6076- Detector: Filter move timeout (type: X, status: X )**

**6077- Detector: Filter move failed (type: X, status: X )**

**6078- Detector: CCD temperature out of range (A/D: X)**

**6079- Detector: CCD setpoint out of range (A/D: X)**

**6080- Detector: Laser temperature out of range (A/D: X)**

**6081- Detector: Laser setpoint out of range (A/D: X)**

**6082- Detector: Detector temperature out of range (A/D: X)**

**6083- Detector: Temperature setpoint > X deg below detector. Detector: X  
Laser: X CCD: X**

**6084- Rotator: Rotation timeout (steps = X, status = X, X)**

**6085- Rotator: Output timeout (status = X).**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**6086- Rotator: Interlock disabled.**

*Cause:* The analyzer's front panel is not closed properly.

*Action:* Be sure the front panel is closed completely. If problem persists, contact your local Micromeritics representative.

**6087- Rotator: Position unknown.**

**6088- Rotator: Command error (status = X).**

**6089- Rotator: Position error (status = X).**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

- 6090- LSHU: Error sending message.**  
**6091- LSHU: Error receiving message.**  
**6092- LSHU: Error parsing message (options=X, state=X)**

*Cause:* A communications problem between the analyzer and liquid sample handler has occurred.

*Action A:* Check the cable connection between the analyzer and the liquid sample handler.

*Action B:* Exit the Saturn DigiSizer application; turn off the analyzer and liquid sample handler. Then turn on the liquid sample handler first, the analyzer second, and restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

- 6093- LSHU: Error circulating pump thermal overload.**  
**6094- LSHU: Error 24 Volt line is not available.**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

- 6095- MasterTech: Not responding.**  
**6096- MasterTech: Error moving arm (expected X, actual X)**  
**6097- MasterTech: Stirrer on/off error (expected X, actual X)**  
**6098- MasterTech: Stirrer speed error (expected X, actual X)**  
**6099- MasterTech: Pump on/off error (expectedX, actual X)**  
**6100- MasterTech: Pump direction error (expected X, actual X)**  
**6101- MasterTech: Ultrasonic on/off error (expected X, actual X)**  
**6102- MasterTech: Error moving turntable (expected X, actual X)**  
**6103- MasterTech: Error querying**  
**6104- MasterTech: Error getting status**

*Cause:* A communications problem between the analyzer and the MasterTech has occurred, or the MasterTech has malfunctioned.

*Action A:* Check the cable connection between the analyzer and the MasterTech.

*Action B:* Exit the Saturn DigiSizer application, and turn off the analyzer, the liquid sample handler, and the MasterTech. Then turn on the MasterTech first, the liquid sample handler second, and the analyzer third. Restart the Saturn DigiSizer application. If the problem persists, contact your local Micromeritics representative.

- 6105- Detector operation: Error light dose offset out of range (X).**
- 6106- Detector operation: Error beam transmittance offset out of range (X).**
- 6107- Detector operation: Error light dose integrating offset out of range (X)**
- 6108- Detector operation: Error beam transmittance integrating offset out of range (X).**
- 6109- Detector operation: Error light dose offset calibration failed (X,X).**
- 6110- Detector operation: Error light close integrating offset calibration failed (X, X).**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**6111- Detector operation: Error, unable to calculate beam center (X).**

*Cause:* Excessive vibration is preventing repeatable beam center alignment.

*Action A:* Position the liquid sample handler so that only the soft foam rings surrounding the cell tubing are in contact with the analyzer, creating a light, tight seal. Metal-to-metal contact causes excessive vibration of the analyzer.

*Action B:* Minimize external sources of vibration. If problem persists, contact your local Micromeritics service representative.

**6113- Detector operation: Error, unable to select optic axis.**

**6114- Detector operation: Error, unable to locate optic axis (X,X).**

*Cause:* Excessive vibration is preventing repeatable beam center alignment.

*Action A:* Position the liquid sample handler so that only the soft foam rings surrounding the cell tubing are in contact with the analyzer, creating a light, tight seal. Metal-to-metal contact causes excessive vibration of the analyzer.

*Action B:* Minimize external sources of vibration. If problem persists, contact your local Micromeritics service representative.

**6115- Detector operation: Error finding rotation lower limit switch.**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics service representative.

**6116- Error, timeout on draining reservoir.**

*Cause A:* Drain tubing may be obstructed

*Action A:* Ensure that the drain tubing is unobstructed and the outlet end is not submerged in the waste liquid.

*Cause B:* A drain valve or level sensor malfunction has occurred.

*Action B:* Access the instrument schematic and enable manual control. Open and close the drain valve several times. Then rinse the system. If the problem persists, contact your local Micromeritics service representative.

**6117- Error, timeout on filling reservoir. Make sure there is liquid present and resume the analysis.**

*Cause A:* The analysis or rinse liquid inlet tubing is out of liquid.

*Action A:* Check the analysis and rinse liquid tubes to ensure that they are both submerged and have adequate supplies of liquid.

*Cause B:* The analysis or rinse pump is unable to prime itself.

*Action B:* Raise the liquid container above the liquid sample handler and resume operation. After the liquid has started to pump, place the container back in its normal position.

*Cause C:* A hardware malfunction has occurred.

*Action C:* Contact your local Micromeritics service representative.

**6118- Error, fill stabilization failed after X tries.**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**6119- Error, rinse failed after [n] tries. Current obscuration [n]. Required obscuration [n].**

*Cause A:* The cell and liquid sample handler are clean, but the beam transmittance has changed since the last background measurement.

*Action A:* Perform a background analysis.

*Cause B:* The liquid sample handler and/or sample cell are dirty and cannot be cleaned by rinsing.

*Action B:* Use a surfactant that will effectively remove the contamination and perform a rinse, or manually clean the sample cell and the liquid sample handler.

*Cause C:* The rinse liquid differs in transmittance from the liquid used in the current background measurement.

*Action C:* Perform as many rinses as is necessary to clean the system. Do not use the **Authorinse** function with a liquid which differs substantially in transmittance from the last background analysis liquid. Always perform a background measurement with the current analysis liquid before analyzing samples.

**6120- Error, ultrasonic probe is out of liquid.**

*Cause:* Ultrasonic probing was requested when the liquid level was not at least primed.

*Action:* Fill the liquid sample handler with liquid before turning on the probe.

**6121- Error, Maximum number of overrange pixels was exceeded (X, X).**

*Cause:* A hardware malfunction has occurred.

*Action:* Contact your local Micromeritics representative.

**6125- The instrument <serial number> is not calibrated.**

*Cause:* You started the application program, but no calibration files were found for the attached instrument.

*Action:* Run the Setup program and reinstall the calibration files.

**6128- Invalid deconvolution results.**

*Cause:* The deconvolution was unable to create a valid particle size distribution from the collected intensity data.

*Action A:* Make sure enough sample was used in the analysis to provide good intensity data.

*Action B:* Measure a background to ensure that this information is still valid.

**6130- No data available in file <file name> for reporting.**

*Cause:* You requested that a report be generated on a sample containing no particle size data.

*Action:* Wait for the completion of at least one test, and then try again.

**6132- Warning, the default sample file does not request a rinse after analysis.**

*Cause:* You selected the QuickStart **Autodetect** mode of analysis, but the default sample file does not specify a rinse after analysis. This may result in repeated analyses of the same physical sample.

*Action:* Unless you plan to repeat the analysis on the same sample, cancel the QuickStart window. Access **Sample defaults** from the Options menu and specify to rinse after analysis. Then restart the QuickStart mode.

**6133- Configured serial number does not match instrument.**

*Cause:* The instrument serial number specified for this unit during installation does not match the serial number recorded in the attached instrument.

*Action:* Attach the correct instrument, or run the Setup program and install the calibration files for the correct instrument serial number. The instrument serial number is located on the back panel of the analyzer.



**6134- Detector: Temperature control reset.**

*Cause:* Temperature control of the laser and CCD was spontaneously disabled, possible due to electrostatic discharge. The temperature control was reenabled automatically.

*Action:* Prepare the area in which the analyzer is located to minimize existence of electrostatic discharge. The analyzer will continue to function properly; however, you should notify your local service representative of this occurrence.

**6135- Detector Operation: Warning, beam center drive current adjusted from [nn.nn] to [nn.nn].**

*Cause:* Operating characteristics of the laser have changed since the last focus calibration.

*Action:* A new focus calibration is recommended. The analyzer will continue to function properly. Contact your local service representative.

**6136- Detector Operation: Error, beam center too large.****6137- Detector Operation: Error, beam center underrange.**

*Cause A:* There is an obstruction or dirt in the optical path.

*Action A:* Remove the obstruction or clean the dirty lens or cell. Refer to Chapter 9 for instructions on cleaning the optics.

*Cause B:* A problem has developed in the laser or detector system.

*Action B:* Contact your local Micromeritics service representative.

**6138- Detector Operation: Error, beam center overrange.**

*Cause:* A problem has developed in the laser or detector system.

*Action:* Contact your local Micromeritics service representative.

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## Unnumbered Messages

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These messages display on the instrument schematic as yellow text on a red background in the area of their associated component.

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### Liquid Sample Handler

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#### **24Volt Failure Thermal Overload**

*Cause:* An electronic failure has occurred.

*Action:* Contact your local Micromeritics service representative.

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### Laser

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#### **Filter Error: Sensors on Filter Error: Sensors off**

*Cause:* An electronic failure has occurred.

*Action:* Contact your local Micromeritics service representative.

#### **Laser disabled**

*Cause:* The front panel of the analyzer is open.

*Action:* Ensure that the front panel is completely closed before beginning an operation. If the message remains on the screen after closing the front panel, contact your local Micromeritics service representative.

#### **Laser temperature invalid**

*Cause:* An electronic failure has occurred.

*Action:* Contact your local Micromeritics service representative.

**Laser temperature out of band**

*Cause:* Instrument initialization is in progress.

*Action:* None required; the message will disappear after initialization is complete. If the message should remain displayed on the screen after approximately 10 minutes, contact your local Micromeritics service representative.

**Laser thermal overload  
Temperature control disabled**

*Cause:* An electronic failure has occurred.

*Action:* Contact your local Micromeritics service representative.

**Test switch on**

*Cause:* A manufacturing test switch was accidentally left turned on.

*Action:* None required; the message will disappear when the laser is activated.

**Rotation Arm**

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**Rotator thermal overload**

*Cause:* An electronic failure has occurred.

*Action:* Contact your local Micromeritics service representative.

## **Charge-Coupled Device (CCD)**

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### **CCD temperature invalid**

*Cause:* An electronic failure has occurred.

*Action:* Contact your local Micromeritics service representative.

### **CCD temperature out of band**

*Cause:* Analyzer initialization is in progress.

*Action:* None required; the message will disappear after initialization is complete. If the message should remain displayed on the screen after approximately 10 minutes, contact your local Micromeritics service representative.

## **APPENDIX B**

### **SAMPLE DISPERSION AND CONCENTRATION**

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## SAMPLE DISPERSION AND CONCENTRATION

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Sample dispersion and concentration plays a vital part in obtaining accurate and reliable results. This appendix provides a discussion on dispersion techniques and sample concentration in relation to obtaining an appropriate beam obscuration for your sample.

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### Sample Dispersion

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Sample materials should be well dispersed in a liquid of known density and viscosity and the difference between the powder and liquid densities be accurately known. Viscosity and density data for some common liquids are given in Appendix D. 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.

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.

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 rigorous 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 Saturn DigiSizer 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.

Chemical wetting or dispersing agents also generally aid dispersion. A great variety of such products are marketed. Appendices C and E 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.

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 SediSpense<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 SediSpense 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. SediSpense liquids solubilize adsorbed moisture.

W-series SediSpense liquids are slightly anionic, non-foaming, aqueous formulations. They also produce nearly universal dispersion of systems with concentrations generally below three weight percent.

SediSpense 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. SediSpense 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 SediSpense 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 SediSpense liquids. These are special formulations, slightly cationic, developed to disperse dif-



ficult metal and pigmented resin powders. The W-series SediSpense liquids should be used to disperse those materials which are soluble in the organic SediSpense liquids. See Appendix F for detailed information on SediSpense liquids.

Some powders flocculate upon standing a few moments after having been dispersed. 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. We make this assertion because of the high reproducibility of the DigiSizer when presented identical samples. If the sample preparation technique is deficient in freeing particles one from another or if, though unlikely, it 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.

## Sample Concentration

After you choose a sample file and click **Next**, a window showing the beam obscuration based on your sample's concentration is displayed.

While observing the beam obscuration and concentration, gradually add your sample to the reservoir. Use the following guidelines for your sample concentration:

Expected Mean Particle Diameter (micrometers)	Recommended Beam Obscuration (%)
Less than 1	5 to 10
1 to 10	10 to 15
10 to 100	15 to 20
100 to 1000	20 to 30

If your beam obscuration level is too high, the **Adjust** push buttons on the right side of the dialog can be used to add more liquid. If the **Autodilute** function is being used, concentration adjustment will be made automatically.

If your beam obscuration level is too low, simply add more sample. If the reservoir is too full, again you can use the **Adjust** push buttons to adjust the liquid level.

Listed below are some guidelines for sample concentration in relation to attaining an appropriate beam obscuration for various sized particles.

## Small Particles and Multiple Scattering

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Analysis of small particles (<1 micrometer diameter) is subject to errors caused by multiple scattering, that is light scattered by one particle striking another particle and being scattered again. This effect increases as sample concentration increases, and causes the particle size to appear smaller than it is.

To test for this:

1. Perform an analysis in the recommended beam obscuration range. Run two or more tests to ensure the results are repeatable, indicating that the dispersion is stable.
2. Dilute the sample to a lower beam obscuration, for instance 2% below the first beam obscuration. This is accomplished by clicking **Adjust level to primed** and observing the reduction in beam obscuration. Repeat as needed until the desired beam obscuration is achieved.
3. Perform another analysis of two or more tests and compare the results to the earlier tests. If the lower beam obscuration produces a significantly larger mean particle size, then significant multiple scattering may have occurred with the original concentration. Repeat these steps to determine the obscuration at which there is no significant multiple scattering.

Note that analyzing with beam obscuration of less than 5% is not recommended, since there may not be enough scattered light for an accurate measurement. Running a background analysis shortly before introducing sample may improve results from a low beam obscuration analysis.

## Medium Size Particles

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For particles in the range of 1 to 100 micrometers diameter, it is ideal to use a high enough sample concentration that the Goodness of Fit Report shows the measured intensities level out at smaller scattering angles before decreasing as scattering angle increases. This clearly defines the maximum particle size present. This can be important in detecting dispersion problems indicated by the apparent presence of larger than expected sizes.

## Large Particles

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For particles greater than 100 micrometers in diameter, relatively few particles are required to achieve a given beam obscuration. For this reason using a higher sample concentration can improve repeatability by increasing the number of particles, thus improving the sampling statistics and presenting a more representative sample of the material.

## **APPENDIX C**

### **CHEMICAL AIDS FOR PARTICLE DISPERSION**

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## CHEMICAL AIDS FOR PARTICLE DISPERSION

Name	Type	Active Ingredient
Aerosol 22	Anionic	Tetrasodium N-(1,2-dicarboxyethyl)-N-octadecylsulfosuccinate, 35%
Aerosol OT	Anionic	Dioctyl 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%
TSPP	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

Name	Type	Active Ingredient
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.



## **APPENDIX D**

### **LIQUID DENSITY AND VISCOSITY DATA**

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## LIQUID DENSITY AND VISCOSITY DATA

Listed below are 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
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

Liquid or Solution	Temperature (°C)	Density (g/cm <sup>3</sup> )	Viscosity (mPa•s)
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.

## **APPENDIX E**

### **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 Concord ville 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
Tetrasodium 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

## **APPENDIX F**

# **SEDISPERSE PARTICLE DISPERSION LIQUIDS**

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# SEDISPERSE<sup>®</sup> PARTICLE DISPERSION LIQUIDS

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## Description

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SediSpense A-series and P-series liquids are stable, balanced formulations for dispersing insoluble particles. These liquids are primarily saturated aliphatic hydrocarbons. SediSpense 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. SediSpense liquids solubilize adsorbed moisture.

SediSpense 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.

SediSpense liquids are non-irritating, non-toxic, non-carcinogenic and non-explosive. The organic SediSpense liquids will burn, but will not support combustion at room temperature.

## 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 SediSpense liquids during storage. This is usually a result of exposure to cold temperatures. It is corrected by warming the SediSpense 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 SediSpense W-series liquids. These can usually be removed by filtering and the liquid is again usable for particle dispersion.

## 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 SediSpense 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.

## **APPENDIX G**

### **DATA REDUCTION**

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## DATA REDUCTION

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The volume frequency data corresponding to standard size parameter classes is derived by deconvolution. The particle size for each class is derived by multiplying its size parameter by the wavelength of light produced by the laser in each instrument. The volume frequency data are expressed as a fraction of the total.

The reference for calculation of various statistics is the *ASTM Manual on Presentation of Data and Control Chart Analysis, Sixth Edition, copyright 1990 by American Society for Testing and Materials*. Other calculations have references as noted.

In the following calculations,  $\log()$  always refers to log base 10.  $\ln()$  refers to natural log.

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## Scattering Model Generation

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### Mie and Fraunhofer Calculations

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Scattering models are theoretically derived patterns of light scattered by ideal, spherical particles of a known refractive index, based on Mie theory. The refractive index of the particle relative to the surrounding medium and the ratio of the diameter of the particle to the wavelength of the light are the two distinguishing parameters for each pattern. A simpler, diffraction-only Fraunhofer theory can also be used; it is independent of refractive index. The algorithms used for performing the Mie and Fraunhofer calculations as well as description of the theories are found in *Absorption and Scattering of Light by Small Particles* by Bohren and Huffman.

### Volume Normalization

---

The Mie and Fraunhofer calculations give scattered light intensities and extinction coefficient for an individual particle. These intensities are normalized by particle volume so that all stored patterns are for a unit volume of sample.

### Polarization

---

The calculations provide scattered intensities for light polarized parallel to and perpendicular to the polarization of the incident light. These two components are recorded separately. At the time the model is used, they are combined based on the polarization of the laser in the instrument.

## Size Parameters

---

Models are calculated for a standard set of size parameters, or ratios of particle diameter to wavelength. The actual diameters represented must be calculated by multiplying the size parameter by the wavelength produced by the laser in each instrument.

## Size Subclasses

---

Each size class represents a continuum of sizes spanning the class interval. The Mie and Fraunhofer algorithms calculate a pattern for a single, discrete size. A representative scattering pattern for each class is computed by a weighted average of scattering patterns for different sizes spanning the class, called subclasses. The interval between the subclasses is 1/4 the interval between size classes. In addition to the five subclasses spanning the class interval (including both ends of the interval), the nearest subclass in each adjacent class interval is included for a total of seven subclasses combined in each class. This provides a fairly smooth transition in size class patterns. The patterns are combined using a cosine<sup>2</sup> weighting function, with coefficients of {0.1464,0.5,0.8536,1.0,0.8536,0.5,0.1464}.

## Angle Subclasses

---

Each angle class represents a continuum of angles spanning the class interval. The Mie and Fraunhofer algorithms calculate scattered light intensity for a set of discrete angles. An average intensity for each angle class must be computed by averaging over its angle interval. Scattering patterns for large particle sizes contain very high frequency changes in intensity with angle, requiring averaging over many discrete angles to compute an accurate average intensity. Patterns for small particle sizes have much less detail and require fewer discrete angles for accurate averaging.

For averaging, each angle subclass intensity is weighted by its fraction of the total area subtended by the angle class, which is proportional to the cosine of the angle.

## Scattering Vector

---

Plotting the scattered intensity data versus the magnitude of the scattering vector  $q$  is useful for comparing data on scattering independently of the scattered wavelength:

$$q = \left( \frac{4\pi N}{\lambda} \right) \sin \left( \frac{\theta}{2} \right)$$

where

- $N$  = refractive index of surrounding medium
- $\lambda$  = wavelength of light in a vacuum
- $\theta$  = scattering angle



---

## Deconvolution

---

Deconvolution is the process of determining what distribution of scattering models for different size classes provides the best fit to the measured scattered intensity data for a sample. The inputs to deconvolution are a set of scattering models for different size classes and a set of measured scattered intensity vs. angle data. The output is a volume frequency distribution by size class that best fits the measured intensity data.

The best fit is determined by a weighted, regularized nonnegative least squares method which minimizes  $|Ax - b|$  where  $A$  is a matrix of scattering models and regularization constraints,  $b$  is the measured intensity pattern, and  $x$  is the size distribution resulting from the fit. The matrix  $A$  and vector  $b$  are modified to weight the contribution of error for each measured intensity.

After  $A$  and  $b$  are constructed, the nonnegative least squares fit (NNLS) is performed as described in *Solving Least Squares Problems*, C.L. Lawson and R.J. Hanson, Prentice-Hall, 1974, p.160, with modifications described below.

---

### Angle Classes and Size Classes

---

Each angle class with measured intensity data is included in the deconvolution.

For each scattering model at one of the predefined size classes, a minimum amount of intensity data for the first lobe of the scattering pattern is required in order to characterize adequately the scattering model for that size class. This is expressed as the Minimum Fraction of First Lobe Classes.

For a given size class, let  $M$  be the index of the angle class where the first minimum in the intensity pattern occurs.

Let  $N$  be the first angle class for which significant intensity data was measured, i.e. the first angle class with a Signal Fraction greater than or equal to the Minimum Significant Signal Fraction.

Then if  $(M - N) / M$  is greater than or equal to the Minimum Fraction of First Lobe Classes, the class is included. The largest size class satisfying this criterion is the largest class to be used in deconvolution, or the Maximum Size Class. The number of classes from this class to the smallest size class (inclusive) is the Number of Size Classes.

If the number of measured intensity data points is less than the Number of Size Classes, the Minimum Size Class is increased to make the number of intensity data points and the Number of Size Classes equal.

## Regularization

---

The result of the NNLS deconvolution is regularized by adding an additional set of constraints to minimize the second derivative of the solution vector (the frequency distribution). These constraints are weighted by an overall regularization parameter (RegParam = RegParamHigh, RegParamMed, or RegParamLow) based on the user input degree of smoothing from the Material Properties dialog. The regularization constraints form a tridiagonal submatrix appended to the matrix A as extra rows, with corresponding 0's in b. If there are M angle classes and N size classes, for angle class j and size class k:

$$F_k = \sum_j (A_{k,j-1} - 2 \times A_{k,j} + A_{k,j+1})^2$$

using  $A_{k,-1} = A_{k,M} = 0$

$$G_k = \text{RegParam} \times \ln\left(\frac{1}{F_k}\right)$$

$$A_{M+k,k-1} = G_k \text{ for } k > 0$$

$$A_{M+k,k} = -2 \times G_k$$

$$A_{M+k,k+1} = G_k \text{ for } k > N$$

$$A_{M+k,i} = 0 \text{ for all other } i$$

$$b_{M+k} = 0$$

## Modifications to NNLS

---

After A and b are constructed as above, NNLS is performed as described in *Lawson and Hanson* with the following modifications:

### Maximum Number of Iterations

---

A maximum number of iterations are performed before the result is returned.

### Check for Repeats

---

After each iteration, the result is checked against each of the most recent iterations. If it is identical to any of them, the process is stopped and the result returned.

## Dual Vector

---

The dual vector in NNLS steps 2,3,4 is calculated for largest step size rather than for steepest descent. After vector  $w$  is calculated as in step 2, it is modified:

$$w_j = \frac{w_j}{\sum (E_{ij} \times E_{ij})^2}$$

To shorten computation time by eliminating the addition of size classes that make an insignificant contribution,  $w_j$  is tested against a cutoff value greater than 0:

$$\text{cutoff} = \text{DualThresh} \times \text{MaxModelIntensity} \times \frac{100}{\text{MaxIntensity}}$$

where

$\text{DualThresh}$  = the Dual Vector Threshold and the maximum intensity values as defined above.

## Nonnegative Tolerance Parameter

---

A Nonnegative Tolerance Parameter (referred to as Tau in L&H p.80-81) is used.

Also, this value times the sum of the solution vector is used instead of 0 as the lower limit for nonnegative elements in the solution vector (p.161 step 7).

## Weighted Residual

---

The contribution of an individual intensity error to the total error or residual of the least squares fit is weighted by the fraction of the total intensity signal due to scattering (as opposed to background), and by the magnitude of the intensity:

$$W_i = \left( \frac{I_{SCAT_i}}{I_{TOT_i}} \right)^2 (I_{SCAT_i})^{-0.7}$$

$$E_{SQ_i} = W_i \left( \frac{I_{SCAT_i} - I_{FIT_i}}{I_{FIT_i}} \right)^2$$

$$\text{Weighted Residual} = 100 \left( \frac{\sum E_{SQ_i}}{\sum W_i} \right)^{0.5}$$

where

$W_i$	= weighting factor for intensity point $i$
$I_{SCAT_i}$	= scattered intensity for point $i$
$I_{TOT_i}$	= total intensity (scattered plus background) for point $i$
$I_{FIT_i}$	= model fit intensity for point $i$
$E_{SQ_i}$	= error squared for point $i$

---

## Input Quantities

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### Standard Particle Size Classes and Standard Size Parameter Classes

---

For the predefined size classes:

The diameter interval bounds are spaced geometrically and the average diameter for each interval is the geometric mean of the high and low diameters of the interval. The low diameter for one interval or class is the high diameter for the next interval or class. For a diameter range of 0.1 to 1000.0 and 40 classes per decade:

$$\begin{aligned}\text{ClassFact} &= \text{ratio between adjacent class} \\ &= \text{ratio between adjacent class averages} \\ &= 10^{1/40} = 1.05925372518\end{aligned}$$

The ratio between a class average and either of its class bounds is

$$1.05925372518^{1/2} = 1.0292005272$$

The average diameter array has 172 elements:

$$\text{AvgDiam}[172] = \{0.075, 0.079, 0.084, 0.089, 0.094, 0.100, \dots, 1000.0, 1059.3, 1122.0, 1188.5, 1258.9, 1333.5, 1412.5\}$$

The diameter interval array has 173 elements:

$$\text{IntvlDiam}[152] = \{0.073, 0.077, 0.082, 0.087, 0.092, \dots, 1090.2, 1154.8, 1223.2, 1296.7, 1372.5, 1453.83\}$$

For a laser of the nominal wavelength, these particle size classes correspond to the size parameter classes for which the scattering models are generated and the deconvolution performed. Since all lasers will not have the nominal wavelength, a frequency distribution based on the standard particle size classes must be interpolated from the deconvolution distribution, which is based on the sizes derived from the actual laser wavelength and the standard size parameters:

$$\text{ParticleDiameter} = \text{SizeParameter} \times \text{Wavelength}$$

## High/Low Diameter and Average Diameter

---

For the standard size classes:

Average Diameter is taken directly from the standard size class Average Diameter array AvgDiam[] above.

The High and Low Diameters for class i are:

$$\text{HighDiam}_i = \text{IntvlDiam}[i]$$

$$\text{LowDiam}_i = \text{IntvlDiam}[i-1]$$

For user entered size tables:

The user entries are used as the IntvlDiam array as above, with the HighDiam and LowDiam values assigned from it. Note that there is always one less size interval than the number of entries in IntvlDiam.

$$\text{AvgDiam}_i \text{ is the geometric mean of HighDiam}_i \text{ and LowDiam}_i = (\text{HighDiam}_i \times \text{LowDiam}_i)^{1/2}$$

## Standard Sieve Sizes

ASTM E-11 standard sieve sizes and a few common sizes are used.

Sieve Number (in.)	Aperture Size (μm)	Sieve Number (in.)	Aperture Size (μm)
5	125000	No 8	2360
4.24	106000	No. 10	2000
4	100000	No. 12	1700
3 1/2	90000	No. 14	1400
3	75000	No. 16	1180
2 1/2	63000	No. 18	1000
2.12	53000	No. 20	850
2	50000	No. 25	710
1 3/4	45000	No. 30	600
1 1/2	37500	No. 35	500
1 1/4	31500	No. 40	425
1.06	26500	No. 45	355
1	25000	No. 50	300
7/8	22400	No. 60	250
3/4	19000	No. 70	212
5/8	16000	No. 80	180
0.530	13200	No. 100	150
1/2	12500	No. 120	125
7/16	11200	No. 140	106
3/8	9500	No. 170	90
5/16	8000	No. 200	75
0.265	6700	No. 230	63
1/4	6300	No. 270	53
No. 3 1/2	5600	No. 325	45
No. 4	4750	No. 400	38
No. 5	4000	No. 450	32
No. 6	3350	No. 500	25
No. 7	2800	No. 635	20



## Graph Particle Size Intervals

---

The predefined standard particle size classes are always used in computing quantities for graphs. For merged or entered data, the extra data are shown at the intervals for which it was entered, except for the frequency data for which the predefined classes are extended to the range needed to make sure that all the frequency classes are of the same width.

## Interpolation

---

All interpolation is performed using the Akima semi-spline routine. Refer to *BASIC Scientific Subroutines Vol. II*, by F.R.Ruckdeschel, Copyright 1981 BYTE Publications/McGraw Hill, p. 305. If the quantity to be used as either axis is a size quantity (diameter), the interpolation should be done on a log scale for that axis.

## Merged Data

---

Merged data entries pre-empt compatible collected data; for example if overlap occurs, the merged data are reported and the overlapping sizes from the collected data are discarded.

If sieve size data are entered for the merged data, the aperture size of the smallest sieve size used will not in general fall on a standard particle size class boundary. A 'pbridge' class must be constructed in this case extending from the minimum sieve aperture size to the next lower standard size class boundary. If the resulting class would be less than half the width (on the log diameter scale) of a standard size class, it is combined with the next lower standard size class which becomes the 'bridge' class. A cumulative coarser value is interpolated at the minimum aperture size from the collected data, which becomes the cumulative coarser value for the 'bridge' class. The frequency for the 'bridge' class can then be calculated from the cumulative coarser curve in the normal way. The 'bridge' class is treated as a collected data class for purposes of subsequent scaling and reporting.

If Autoscale percent/fraction of total sample is enabled on the Collected Data/Merge Data dialog, the region of overlap between merge data and collected data is determined, and a scale (which is equal to the total frequency of the merged data in the overlap region over the total frequency of the collected data in the overlapped region) factor is determined. The collected data are then scaled by this factor. Finally, the frequency data over the whole range is rescaled to the total fraction accounted for by the merged data. All this is done in the Frequency fraction determined by the user (Volume/Area/Length/Number).

If Autoscale percent/fraction of total sample is disabled on the Collected Data/Merge Data dialog, the entered percentiles/fractions for the merged data are used as is and the non overlapping portion of the collected data is scaled to be the percent/fraction passing the smallest sieve size used.

---

## Fundamental Quantities

---

### Distribution Type (Volume, Area, Length, Number)

---

The base distribution data provided by the deconvolution is volume frequency fraction. Conversion of the distribution to area, length, or number is as follows for each size class<sub>i</sub>:

$$\text{AreaFreqFrac}_i = \frac{\text{VolFreqFrac}_i / \text{AvgDiam}_i}{\sum \text{VolFreqFrac}_k / \text{AvgDiam}_k}$$

$$\text{LenFreqFrac}_i = \frac{\text{VolFreqFrac}_i / \text{AvgDiam}_i^2}{\sum \text{VolFreqFrac}_k / \text{AvgDiam}_k^2}$$

$$\text{NumFreqFrac}_i = \frac{\text{VolFreqFrac}_i / \text{AvgDiam}_i^3}{\sum \text{VolFreqFrac}_k / \text{AvgDiam}_k^3}$$

or to convert back to Volume percent based on the others,

$$\text{VolFreqFrac}_i = \frac{\text{AreaFreqFrac}_i \cdot \text{AvgDiam}_i}{\sum \text{AreaFreqFrac}_k \cdot \text{AvgDiam}_k}$$

$$\text{VolFreqFrac}_i = \frac{\text{LenFreqFrac}_i \cdot \text{AvgDiam}_i^2}{\sum \text{LenFreqFrac}_k \cdot \text{AvgDiam}_k^2}$$

$$\text{VolFreqFrac}_i = \frac{\text{NumFreqFrac}_i \cdot \text{AvgDiam}_i^3}{\sum \text{NumFreqFrac}_k \cdot \text{AvgDiam}_k^3}$$

These Formulae will automatically normalize the Frequency fractions to 100%. If there exists merged or entered data, the user may have chosen not to have this add up to 100%. If this is the case, a conversion into the style (Vol/Area/Len/Num) that he has chosen will also cause a rescaling to his chosen percentage. A conversion into a different style will automatically be rescaled to 100%. This affects the cumulative percentage as well as things like median diameter which are based on cumulative coarser. For distribution statistics, there is an implicit rescaling to 100%.

Subsequent calculations based on the frequency distribution do not vary based on Distribution Type; therefore the formulas reference FreqFrac without specification of Distribution Type.

## Particle Size (Diameter/Radius)

---

Any particle size quantity or derived quantity having the same units can be expressed as radius or diameter.

$$\text{Radius} = \text{Diameter} / 2$$

Quantities include:

- Mean
- Mode
- Median
- Standard deviation (of the distribution)
- Confidence limits
- Size at User Defined Percentiles
- User Defined Sizes
- High particle size
- Low particle size
- Average particle size
- Standard deviation for [n] tests of any of the above quantities

## Percent/Fraction

---

Any cumulative quantity, frequency quantity, percentile, or derived quantity having the same units can be expressed as percent or fraction.

$$\text{Pct} = 100 \times \text{Frac}$$

These include:

- Maximum Out of spec
- User Defined Percentiles 1 to 5
- Percent at User Defined Sizes 1 to 5
- Peak Report Minimum percent to report
- Peak Report Percent of distribution
- Cumulative Coarser/Finer
- Frequency
- Difference from reference
- Out of spec
- Standard deviation for [n] tests of any of the above quantities

Other quantities (Sample concentration, Beam obscuration) are calculated or stored as fractions but reported as percent.

## Cumulative Coarser/Finer, Retained/Passed

---

Any cumulative quantity can be expressed as Coarser or Finer (Retained or Passed on Tabular Report by Sieve Size).

For data defined by the standard class sizes (Summary, Tabular Defined by Size Class, Graphs):

$$\text{CumFracCoarser}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k > \text{AvgDiam}_i$$

$$\text{CumFracFiner}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k < \text{AvgDiam}_i$$

$$\text{CumFracRetain}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k > \text{AvgDiam}_i$$

$$\text{CumFracPass}_i = \sum \text{FreqFrac}_k \text{ for all classes } k \text{ such that } \text{AvgDiam}_k < \text{AvgDiam}_i$$

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 Size Table 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.

## Frequency

---

Frequency is always calculated for a class. It is always the difference in the CumFracCoarser at the upper bound and the lower bound of the class. If this is a standard class, it is calculated as follows

$$\text{FreqFrac}_i = \text{CumFracCoarser}_{i-1} - \text{CumFracCoarser}_i$$

If it is not a standard class, The value of CumFracCoarser is interpolated at the two endpoints.

## User-Entered Percentile Size

---

If the UserPct<sub>n</sub> is larger then the total percentage accounted for by any merged or user entered data, then “ \*\*\*\*\* ” is printed.

UserPctDiam<sub>n</sub> = Diameter interpolated from HighDiam<sub>i</sub> vs. CumFracCoarser<sub>i</sub> at UserPct<sub>n</sub>

## User-Entered Size Percent

---

UserDiamFrac<sub>n</sub> = CumFracCoarser interpolated from CumFracCoarser<sub>i</sub> vs. HighDiam<sub>i</sub> at UserDiam<sub>n</sub>

## Peak Report Quantities

---

$$\text{DiffFreqFrac}_i = \text{FreqFrac}_i / \log(\text{HighDiam}_i / \text{LowDiam}_i)$$

Starting at the small particle size end of the frequency distribution,

1. Scan DiffFreqFrac<sub>i</sub> for a local maximum, i.e. DiffFreqFrac<sub>k</sub> > DiffFreqFrac<sub>k+1</sub> and DiffFreqFrac<sub>k</sub> > DiffFreqFrac<sub>k-1</sub>

AvgDiam<sub>k</sub> is the mode of the candidate peak.

2. If an unresolved peak remains from step 3 of the preceding peak, the LowDiam from that unresolved peak is the LowDiam for this candidate peak. Otherwise, scan DiffFreqFrac<sub>i</sub> from class k toward smaller particle sizes to find a local minimum,

i.e. DiffFreqFrac<sub>m</sub> = 0

or DiffFreqFrac<sub>m</sub> < DiffFreqFrac<sub>m+1</sub> and DiffFreqFrac<sub>m</sub> < DiffFreqFrac<sub>m-1</sub>

If DiffFreqFrac<sub>m</sub> < (DiffFreqFrac<sub>k</sub>\* Minimum Peak Valley Decrease), LowDiam<sub>m</sub> is the LowDiam of the candidate peak. Otherwise, this is an unresolved peak and will be added to the previous peak.

3. Scan  $\text{DiffFreqFrac}_i$  from class k toward larger particle sizes to find a local minimum,

i.e.  $\text{DiffFreqFrac}_n = 0$

or  $\text{DiffFreqFrac}_n < \text{DiffFreqFrac}_{n+1}$  and  $\text{DiffFreqFrac}_n < \text{DiffFreqFrac}_{n-1}$

If  $\text{DiffFreqFrac}_n < (\text{DiffFreqFrac}_k * \text{Minimum Peak Valley Decrease})$ ,  $\text{HighDiam}_n$  is the  $\text{HighDiam}$  of the candidate peak. Otherwise, this is an unresolved peak and will be added to the next peak. Record the  $\text{LowDiam}$  for this unresolved peak for use on the next peak and repeat from step 1.

4. Sum values of  $\text{FreqFrac}_i$  from  $i=m$  to  $i=n$ , but include only half of the  $\text{FreqFrac}$  values for end classes m and n. This is to split the frequency data between two adjacent peaks.

If this is an unresolved peak as determined in step 2, add the sum to the  $\text{Fraction of Distribution}$  for the preceding peak and set the preceding peak's  $\text{HighDiam}$  to n.

Otherwise, if the sum is greater than or equal to the  $\text{Minimum Fraction to Report}$ , the candidate peak is qualified and the sum is the  $\text{Fraction of Distribution}$ . Other peak quantities are calculated using the same formulas as for the entire distribution, except only the range from class m to class n is used.

Otherwise, the candidate peak is disqualified.

5. 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.

#### NOTES:

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 step 3, the beginning or ending class is treated as the local minimum.

For calculating  $\text{Standard Deviation for N Tests}$ , 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,  $\text{Standard Deviation for N Tests}$  is reported as "N/A." 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).

---

## Size Statistics

---

### Standard Deviation of Quantity for N Tests

---

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. Else;

$$\text{MeanTestQuantity} = \frac{\sum \text{Quantity}_k}{\text{NumTests}}$$

$$\text{StdDevTestQuantity} = \sqrt{\frac{\sum (\text{Quantity}_k - \text{MeanTestQuantity})^2}{\text{NumTests} - 1}}$$

### Mode

---

For 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 are 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

### Median

---

MedianDiam = Diameter interpolated from HighDiam vs. CumFracCoarser at CumFracCoarser = .5. If the calculation is being done on a peak, the interpolation point is at CumFracCoarser = (CumFracCoarser<sub>m</sub> + CumFracCoarser<sub>n</sub>)/2.

### Arithmetic Calculations

---

Standard Deviation (of the distribution):

$$\text{MeanDiam} = \frac{\sum \text{FreqFrac}_i \cdot \text{AvgDiam}_i}{\sum \text{FreqFrac}_i}$$

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:

$$\text{CoefVar} = \frac{\text{StdDevDiam}}{\text{MeanDiam}}$$

Skewness:

$$\text{Skew} = \frac{\sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^3 / \sum \text{FreqFrac}_i}{\left( \sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^2 / \sum \text{FreqFrac}_i \right)^{3/2}}$$

Kurtosis:

$$\text{Kurt} = \frac{\sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^4 / \sum \text{FreqFrac}_i}{\left( \sum \text{FreqFrac}_i (\text{AvgDiam}_i - \text{MeanDiam})^2 / \sum \text{FreqFrac}_i \right)^2} - 3$$

+x  $\sigma$

$$\text{PlusNSig} = \text{MeanDiam} + x \cdot \text{StdDevDiam}$$

where x is the user-selected number.

-x  $\sigma$

$$\text{MinusNSig} = \text{MeanDiam} - x \cdot \text{StdDevDiam}$$

where x is the user-selected number.



## Geometric Calculations

---

Mean:

$$\text{GeoMeanDiam} = 10^{\frac{\sum \text{FreqFrac}_i \log(\text{AvgDiam}_i)}{\sum \text{FreqFrac}_i}}$$

Standard Deviation (of the distribution):

$$\text{GeoStdDevDiam} = 10^{\text{StdDevLogDiam}}$$

Standard Deviation of Log (size):

$$\text{StdDevLogDiam} = \sqrt{\frac{\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^2}{\sum \text{FreqFrac}_i}}$$

Skewness of Log (size):

$$\text{SkewLog} = \frac{\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^3 / \sum \text{FreqFrac}_i}{\left( \sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^2 / \sum \text{FreqFrac}_i \right)^{3/2}}$$

Kurtosis of Log (size):

$$\text{KurtLog} = \frac{\sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^4 / \sum \text{FreqFrac}_i}{\left( \sum \text{FreqFrac}_i (\log(\text{AvgDiam}_i) - \log(\text{GeoMeanDiam}))^2 / \sum \text{FreqFrac}_i \right)^2} - 3$$

+xσ:

$$\text{PlusnSigLog} = 10^{\log(\text{GeoMeanDiam}) + x \log(\text{GeoStdDevDiam})}$$

where x is user-selected number.

-xσ:

$$\text{MinusnSigLog} = 10^{\log(\text{GeoMeanDiam}) - x \log(\text{GeoStdDevDiam})}$$

where x is user-selected number.

---

## Material Formulae

---

### Relative refractive index

---

Relative refractive index is the complex quotient of the complex Particle refractive index and the real Analysis Liquid refractive index:

$$\text{RelRefIdx(Re)} = \frac{\text{ParticleRefIdx(Re)}}{\text{LiquidRefIdx}}$$

$$\text{RelRefIdx(Im)} = \frac{\text{ParticleRefIdx(Im)}}{\text{LiquidRefIdx}}$$

### Sample Concentration

---

This is calculated exclusively for the collected and deconvoluted data.

BeamObscuration is obtained from collected data.

BeamLength<sub>m</sub> = 5000

ExtCoef<sub>i</sub> = extinction coefficient for size class i, available from scattering model

$$\text{ConcFrac} = \frac{\log(1 - \text{BeamObscuration})}{-\frac{3}{2} \text{BeamLength}_{\mu\text{m}} \left[ \frac{\sum \text{ExtCoef}_i \text{VolFreqFrac}_i / \text{AvgDiam}_i}{\sum \text{VolFreqFrac}_i} \right]}$$

### Specific Surface Area

---

This is calculated exclusively for the collected and deconvoluted data.

ParticleDensity is obtained from the Material Properties.

$$\text{SurfArea} = \frac{6 \left[ \frac{\sum \text{VolFreqFrac}_i / \text{AvgDiam}_i}{\sum \text{VolFreqFrac}_i} \right]}{\text{Particle Density}}$$

---

## Specification/Reference Quantities

---

### Out of Spec

---

$SampCumFrac_i$  = 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 the tests in that sample file\*.

$FineSpecCumFrac_i$  = cumulative fraction coarser/finer/passed/retained for class  $i$  from Fine Specification distribution interpolated if the bins are of different size. This is always the average of all the tests in that sample file\*.

If {  $SampCumFracCoarser_{i-1} > CoarseSpecCumFracCoarser_{i-1}$  }

$OutSpecFracCoarser_i = SampCumFracCoarser_{i-1} - CoarseSpecCumFracCoarser_{i-1}$

Else if {  $SampCumFracCoarser_{i-1} < FineSpecCumFracCoarser_{i-1}$  }

$OutSpecFracCoarser_i = SampCumFracCoarser_{i-1} - FineSpecCumFracCoarser_{i-1}$

Else  $OutSpecFracCoarser_i = 0$

**or**

$OutSpecFracFiner_i = -OutSpecFracCoarser_{i-1}$

$OutSpecFracRetain_i = OutSpecFracCoarser_{i-1}$

$OutSpecFracPass_i = -OutSpecFracCoarser_{i-1}$

### Difference from Reference

---

$SampCumFrac_i$  = cumulative fraction coarser/finer/passed/retained for class  $i$  from sample distribution

$RefSpecCumFrac_i$  = 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 that sample file\*.

$DiffRefCoarser_i = SampCumFrac_i - RefCumFrac_i$

---

\* Always using the average of the tests in reference files is done so that printing out reports on a file will not affect its use as a reference.

**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**

---

$$\text{MaxOutSpecFrac} = \text{maximum}( \text{abs value}( \text{OutSpecFrac}_i ) )$$

## **Pass/Fail by Specification**

---

If  $\text{MaxOutSpecFrac} = 0$

PassFail = "PASSED by Specification"

ElsePassFail = "FAILED by Specification"

---

## SPC Report Variables

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### Regression Chart Variables

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The line of best fit for the Regression Chart is calculated by the usual Least Squares method. Refer to *BASIC Scientific Subroutines Vol. II*, by F.R. Ruckdeschel, Copyright 1981 BYTE Publications/McGraw Hill, p. 16. 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.

$$X_{ave} = \frac{\sum x_i}{N}$$

$$Y_{ave} = \frac{\sum y_i}{N}$$

$$\text{Slope} = \frac{\text{Sum } (x_i - X_{ave})(y_i - Y_{ave})}{\sum (x_i - X_{ave})^2}$$

The coefficient of Correlation for this line is also calculated in the usual way. Refer to *Mathematical handbook for Scientists and Engineers*, by Granino A Korn, and Theresa M. Korn, Copyright 1961, 1968 McGraw Hill, Sec 18.4.

$$\sigma_x = \sqrt{\frac{\sum (x_i - X_{ave})^2}{N}}$$

$$\sigma_y = \sqrt{\frac{\sum (y_i - Y_{ave})^2}{N}}$$

$$\text{Cov}(x, y) = \frac{\sum (x_i - X_{ave})(y_i - Y_{ave})}{N}$$

$$\text{CorrelationCoef} = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y}$$

## Control Chart Variables

---

$$\text{Mean} = \frac{\sum y_i}{N}$$

$$\text{StdDev} = \sqrt{\frac{\sum (y - \text{Mean})^2}{N-1}}$$

$$\text{CoefVar} = \frac{\text{StdDev}}{\text{Mean}}$$

$$\text{PlusNSig} = \text{Mean} + n \cdot \text{StdDev}$$

$$\text{MinusNSig} = \text{Mean} - n \cdot \text{StdDev}$$

## **APPENDIX H**

### **FORMAT OF EXPORTED DATA**

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## FORMAT OF EXPORTED DATA

---

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.

The following types of data can be exported:

- Particle Size
- Intensity

---

### Particle Size Data

---

Record Number	Information Conveyed	Form
1	File status 1 = complete 2 = analyzing 4 = entered 8 = no analysis	integer
2	Sample identification	quoted string (40 characters)

#### Merged Data (if present in sample file)

1	Blank line	
2	Merged data indicator	“Merged Data”
3	Distribution type 0 = volume 1 = area 2 = number	integer
4	Number of points	integer
5	Particle size, cumulative fraction/percent (units as per the data presentation settings, repeated for each point)	floating point, floating point

#### Collected Data

1	Blank line	
2	Test data identifier	“Test n:” where n = test number
3	Distribution type 0 = volume 1 = area 2 = number	integer
4	Number of points	integer

<b>Record Number</b>	<b>Information Conveyed</b>	<b>Form</b>
5	Particle size, cumulative fraction/percent (units as per the data presentation settings, repeated for each point)	floating point, floating point
Records 1 through 5 repeated for every test in sample file. Test data identifier is changed accordingly.		

---

## **Intensity Data**

---

<b>Record Number</b>	<b>Information Conveyed</b>	<b>Form</b>
<b>Intensity Data</b>		
1	Blank line	
2	Test data identifier	“Test n:” where n = test number
3	Beam obscuration	floating point
4	Polarization	floating point
5	Laser wavelength	floating point
6	Number of points	integer
7	Bounding angle class, intensity (repeated for each point)	floating point, floating point
8	Bounding angle class	floating point
Records 1 through 8 repeated for every test in sample file. Test data identifier is changed accordingly.		

### **Background Data**

1	Background data identifier	“Background:”
2	Number of points	integer
3	Bounding angle class, intensity (repeated for each point)	floating point, floating point
4	Bounding angle class	floating point
Records 1 through 4 repeated for every test in sample file. Background data identifier is changed accordingly.		

## **APPENDIX I**

# **ATTACHING MULTIPLE ANALYZERS TO A SINGLE COMPUTER**

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---

## Attaching Multiple Analyzers to One Computer

---

You can install up to two Saturn DigiSizer analyzers to one computer, allowing for high sample throughput. Each analyzer can also have a MasterTech autosampler attached. The MasterTech allows you to queue up to 18 samples for analysis. Each sample is transferred to the Saturn DigiSizer automatically, requiring no further operator intervention until the queued analyses are complete.

The following items are required for installing two analyzers:

- One Ethernet switch
- One standard Ethernet cable for each Saturn DigiSizer to be attached
- One standard Ethernet cable for connecting the computer and the Ethernet switch

When attaching two analyzers to one computer, installation and configuration depends on whether you are:

- installing two analyzers from the factory, each with a default configuration, to a single computer
- installing two existing, configured analyzers on a new computer, requiring a new install of the analysis program
- moving an existing, configured analyzer from one computer to another one that already has a Saturn DigiSizer installed

---

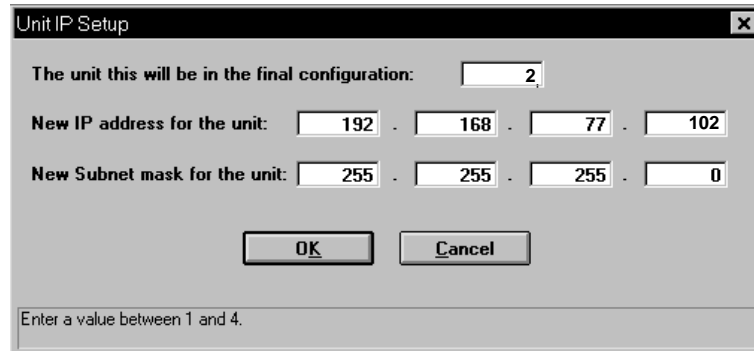
## Installing a Second Analyzer with Default Configurations

---

These instructions are for installing a second analyzer with a default configuration to a computer that already has an analyzer (Unit #1) installed.

1. Connect the ethernet switch (refer to the manufacturer's manual for instructions).
2. Exit the analysis program (if operating) and turn the installed analyzer (Unit #1) off.
3. Disconnect the Ethernet *crossover* cable that is currently connected to the analyzer and computer, and store in a safe place.
4. Connect one end of a *standard* Ethernet cable to the Ethernet card (exposed on the back side of the computer) and the other end to a port on the Ethernet switch.
5. Connect one end of a standard Ethernet cable to the connector labeled **Ethernet** on the rear panel of Unit #1 and the other end to a port on the Ethernet switch.
6. Turn the analyzer on.
7. Start the analysis program. This step is simply to ensure that all cable connections are secure. If the program fails to initialize the communications link, check cable connections.
8. Exit the analysis program.
9. Disconnect the Ethernet cable for Unit #1 from the Ethernet *switch*; do not disconnect the cable from the analyzer.
10. Connect one end of another Ethernet cable to the connector labeled **Ethernet** on the rear panel of Unit #2 and the other end to a port on the Ethernet switch.
11. Turn Unit #2 on.
12. Start the analysis program. The analysis program does not know that a second unit has been attached at this time; therefore, all unit references still display as Unit #1. Because of this, you may receive Error Message 6133; simply click  to clear the message.
13. Click  to acknowledge and close the calibration message.
14. Select **Unit configuration** from the **Unit 1** menu; the Unit Configuration dialog is displayed.

15. Click **Change**; the Unit IP Setup dialog is displayed.
16. Enter **2** for the final configuration of this unit (first line).



17. Enter **102** as the new IP address for Unit #2 (fourth field of second line).
18. Record the IP address and subnet mask on the Saturn DigiSizer Configuration form (the last page of this appendix).
19. Click **OK** to close the **Unit IP Setup** dialog,
20. Record the Unit number and serial number on the Saturn DigiSizer Configuration form (located at the back of this appendix). Also record the date, then click **OK** to close the Unit Configuration dialog.
21. Exit the analysis program.
22. Turn Unit #2 off.
23. Reconnect the Ethernet cable of Unit #1 to the Ethernet switch.
24. Insert the analysis program CD into the CD-ROM drive.
25. Select **Start** from the Task bar, and **Run** from the Start menu.
26. Enter the drive designator of the CDROM drive, followed by SETUP; for example, **e:setup**.
27. Click **Next >>** to display the update dialog; choose **Change the number of units**.
28. Click **Next >>**; specify 2 as the number of units to be attached to the computer.

29. Click **Next >>**; the Units dialog is displayed.

Units

**micromeritics**

For each unit, enter the necessary information below.  
The instrument serial number should consist of four digits.

Unit #	Instrument Serial #
<input type="text"/>	<input type="text" value="1234"/>
<input type="text"/>	<input type="text"/>

**Next >**   **< Back**   **Exit**

30. Enter the serial number of the unit added.
31. Click **Next >>**; a dialog containing the source folder (directory) of the calibration files for Unit #1 is displayed.
- If the calibration files for this unit have been installed, click **Cancel**; if not, insert the program CD containing the calibration files for Unit #1 and click **Next >>**. The dialog containing the source folder (directory) of the calibration files for the next unit is displayed. Remove the CD containing the calibration files for Unit #1.
32. Insert the program CD containing the calibration files for Unit #2 and click **Next >>** to copy its calibration files.
33. Click **Finish** to close the dialog; remove the CD.
34. Turn both units on and start the analysis program.



---

## Installing Existing Configured Analyzers to a New Computer

---

Use the instructions in this section to install two existing configured, analyzers on a different computer (perhaps a newly purchased one) that does not have the analysis program installed.

1. Install the analysis program on the new computer following the steps outlined in Chapter 2 for **Initial Installation**. When prompted for the number of analyzers you plan to install, specify the **actual** number you are installing.
2. Use Windows NT Explorer to edit the WIN5200.ini file:
  - a. Select **Start, Programs, Windows NT Explorer**.
  - b. Open the directory where the analysis program is installed (the default is C:\5200)
  - c. Select **View, Details** from the Explorer menu.
  - d. Double-click on the **WIN5200.ini (Type = Configuration Settings)**. This opens Notepad, displaying the ini file.
  - e. Cursor (or page-down) to the section titled **[Unit 1]**.
  - f. Confirm that there is a **TCPAddr=** entry and that it matches the address recorded on the Saturn DigiSizer Configuration form for this unit. If the entry is not there, add it in the following format:

**TCPAddr=[nnn.nnn.nnn.nnn]**

where n's are replaced with the IP address recorded on the Saturn DigiSizer Configuration form.  
  
If the **TCPAddr=** entry is different from the one recorded on the Saturn DigiSizer Configuration form, enter the correct one.
  - g. Select **File, Save** to save the changes and close Notepad.
3. Disconnect the ethernet cable from the old computer and connect it to the new one.
4. Turn on installed analyzers and start the analysis program.

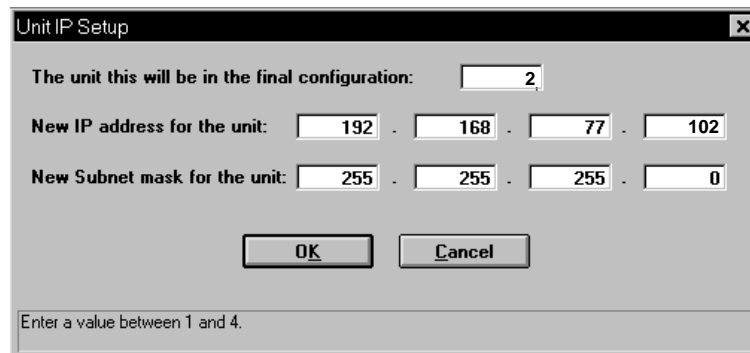
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## Moving an Existing Configured Analyzer to Another Computer

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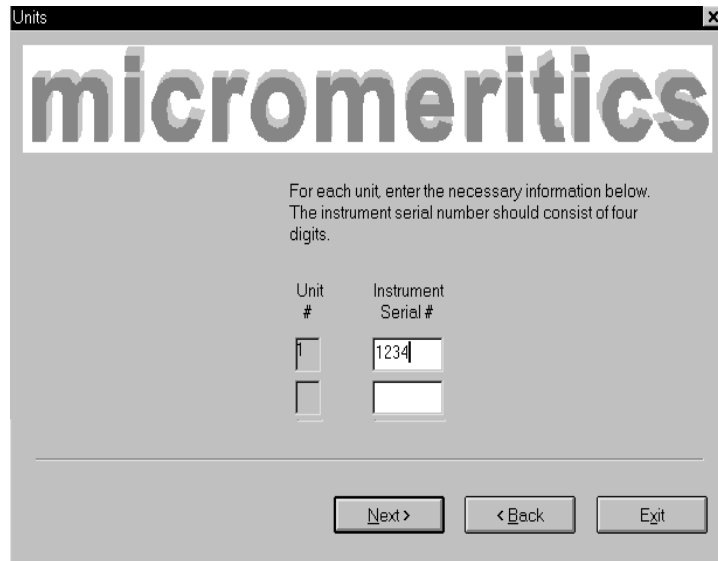
Use the instructions in this section if you have a configured analyzer that you wish to move to a different computer that already has an analyzer and the analysis program installed.

1. Review the Saturn DigiSizer Configuration forms for both the current and destination computers. If there are duplicate IP addresses for analyzers (in most cases, there will be), it is best to change the IP address using the current computer before moving the analyzer.
  - a. Turn on installed analyzers and start the analysis program.
  - b. Select **Unit configuration** from the Unit [n] menu and click ; the Unit IP Setup dialog is displayed.



- c. Enter a new address for the analyzer you are uninstalling and record it on the Saturn DigiSizer Configuration form for the destination computer. For example, the current analyzer is nnn.nnn.nnn.101 and you have an analyzer already installed on the destination computer with the same IP address. Specify the address for the analyzer you are uninstalling as nnn.nnn.nnn.102.
    - d. Click  to close the Unit IP Setup dialog, then again to close the Unit Configuration dialog.
2. Exit the analysis program and turn off all analyzers.
3. Disconnect the Ethernet cable of the analyzer from the current computer (or Ethernet switch) and reconnect to the Ethernet switch for the destination computer.
4. Select **Start** from the Task bar, and **Run** from the Start menu.
5. Enter the drive designator of the CDROM drive, followed by SETUP; for example, **e:setup**.
6. Click  to display the upgrade dialog; choose **Change the number of units**.

7. Click ; specify 2 as the number of units to be attached to the computer.
8. Click ; the Units dialog is displayed.



9. Enter the serial number of the unit you added.
10. Click ; a dialog containing the source folder (directory) of the calibration files for Unit #1 is displayed.
 

If the calibration files for this unit have been installed, click ; if not, insert the program CD containing the calibration files for Unit #1 and click . The dialog containing the source folder (directory) of the calibration files for the next unit is displayed. Remove the program CD containing the calibration files for Unit #1.
11. Insert the program CD containing the calibration files for Unit [n] and click  to copy its calibration files.
12. Click  to close the dialog; remove the CD.
13. Use Windows NT Explorer to edit the **WIN5200.ini** file:
  - a. Select **Start, Programs, Windows NT Explorer**.
  - b. Open the directory where the analysis program is installed (the default is C:\5200)
  - c. Select **View, Details** from the Explorer menu.
  - d. Double-click on the **WIN5200.ini** (Type = **Configuration Settings**). This opens Notepad, displaying the ini file.

- e. Cursor (or page-down) to the section titled **[Unit n]**.
- f. Confirm that there is a **TCPAddr=** entry and that it matches the address recorded on the Saturn DigiSizer Configuration form for this unit. If the entry does not appear, add it in the following format:

**TCPAddr=[nnn.nnn.nnn.nnn]**

where n's are replaced with the IP address recorded on the Saturn DigiSizer Configuration form.

If the **TCPAddr=** entry is different from the one recorded on the Saturn DigiSizer Configuration form, enter the correct one.

- g. Select **File, Save** to save any changes and close Notepad.
14. Turn on both analyzers and start the analysis program.



## **APPENDIX J**

### **BACKGROUND QUALITY**

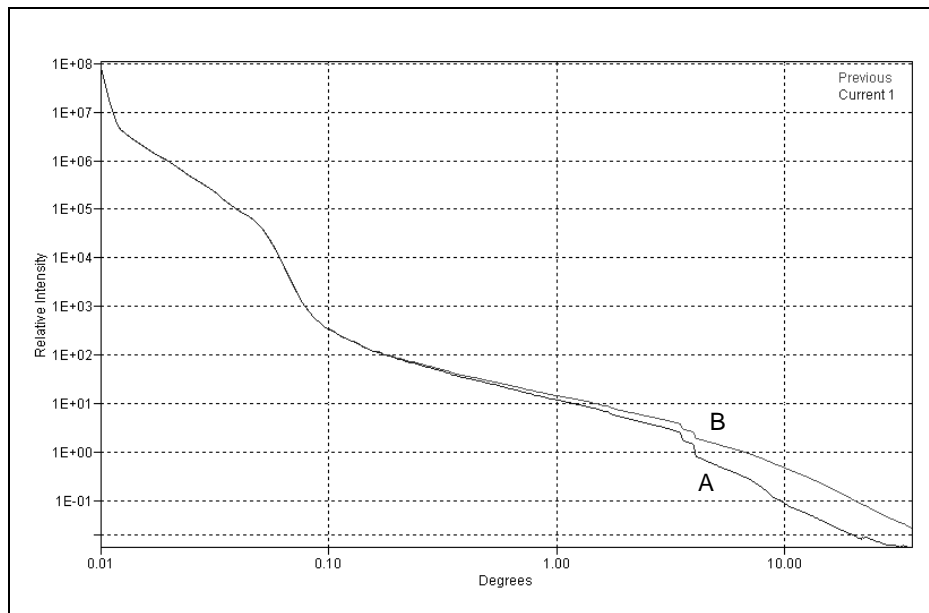
---



## BACKGROUND QUALITY

The results from a background measurement show intensity versus angle when no sample is present in the system to scatter light. When all of the sample has been rinsed from the system and the cell is clean (as indicated by Curve A in Figure 1), the background data will show the lowest possible light intensity levels, decreasing by about 10 orders of magnitude from a maximum at 0.01 degrees to a minimum near 36 degrees. Sharp steps at the boundaries between beam angles (e.g. at approximately four degrees) and other fine details are evident in the intensity curve. This is because unscattered, stray light is being measured, which varies discontinuously with incident beam angle.

When the system is inadequately rinsed or the cell is dirty, higher intensities are seen especially at larger angles (as indicated by Curve B in Figure 1). The data also appear to be smoother, showing less sharp detail. This is because contaminants are present and scattering light in a smooth, continuous fashion. These contaminants may be (1) particles (or bubbles) suspended in the liquid, (2) particles adhered to the inside of the cell, or (3) smudges, fingerprints, dust, etc. on the outside of the cell, on the detector lens, or on the collimator lens.



**Figure 1. Acceptable (Curve A) and Unacceptable (Curve B) Background Measurements.** Notice how much sharper the steps are in Curve A, indicating that unscattered, stray light is being measured. Curve B shows higher intensities and less detail, indicating the presence of contaminants and, therefore, causing the light to scatter smoothly and continuously.



To aid in recognition of a dirty system, the previous background data are shown overlaid with each new set at the end of the background measurement. If the current background curve is higher than the previous, some contamination may exist. Note that some small fluctuations in intensity at large angles can occur due to slight variations in the dissolved oxygen content, or variations in the amount of surfactant in the liquid.

For your convenience and as a reference for a good background, a sample file containing background and sample data from the instrument calibration and check-out is included with your instrument calibration files. This file is named MRMxxx.SMP (where xxx = instrument serial number) and is located in the \5200\Data directory. This file shows what a background looked like when the instrument was new and clean, and provides a valuable point of reference. You may wish to select this file for overlay on the current background report (refer to **Background** in Chapter 7).

If a contaminated background is indicated, perform 1 to 3 rinse cycles to remove any remaining suspended particles; then remeasure the background. If background data do not return to the minimum level, (1) check the analysis liquid for contaminants, or (2) try preparing a fresh batch of analysis liquid. Excess dissolved oxygen or bacterial growth may cause problems in liquid that has been allowed to stand for more than a few days. If the problem persists, drain the system and remove and clean the cell following the instructions provided in Chapter 9. Reinstall the cell and repeat the background measurement.

If frequent cell cleaning is necessary it may be that the system is not being thoroughly rinsed, or that samples are being improperly dispersed. Excessive sample adherence to the cell is an indication of inadequate dispersion.

## **APPENDIX K**

### **MICROVOLUME SAMPLE ANALYSES**



## MICROVOLUME SAMPLE ANALYSES

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A Microvolume option is available for analyzing samples requiring small amounts of dispersant (refer to Chapter 10 for ordering information). This feature is ideal for materials or dispersants that may be rare or expensive in cost. High-resolution particle size analysis with samples in approximately 7  $\mu\text{L}$  of liquid volume can be performed.

Some dispersants may react to the material of which the stopper is made, causing softening or swelling of the stopper. Hexanes, isooctanes, some petroleum-based fuels, and oils (animal, vegetable, aliphatic) work well as dispersants; do not use alcohols. Custom-made Viton stoppers are available as a special order for dispersants such as alcohol; contact Micromeritics for pricing and ordering information.

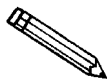


**Do not use alcohol as a dispersant when using the Microvolume option; alcohol is not compatible with the stopper material.**

The same sample cell is used for this procedure as is used for routine analyses on the DigiSizer. However, in lieu of being connected with tubing to the sample handler, the cell is removed, stoppered at both ends, and reinstalled on the cell holder in the analyzer. The liquid sample handler is turned off and is nonfunctional for this type of analysis.

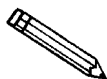
1. Rinse the system if needed, then perform a Drain operation to empty the system of liquid.
2. Exit the Saturn DigiSizer analysis program, then turn off the analyzer and the liquid sample handler.
3. Turn on the analyzer; **do not** turn on the liquid sample handler.
4. Initiate the analysis program. This may take a little longer than usual because the analyzer is trying to detect the presence of the liquid sample handler.
5. Perform a background analysis.
  - a. Open the front panel and remove the analysis compartment cover.
  - b. Remove the sample cell from the cell holder.
  - c. Clean the cell thoroughly, then rinse the inside of the cell with deionized (or distilled) water.
  - d. Holding the cell by the grooved edges, install the bottom stopper (the one without a hole).

- e. Fill the cell with your background liquid.



**If using water as your background/dispersing liquid, it is best to use water that has been degassed. Degassed water is less likely to form bubbles.**

- f. Again, holding the cell by the grooved edges, install the top stopper. Gently press the stopper into place. If any liquid seeps out of the cell, use a lens wipe and wipe the outside of the cell.



**If bubbles form in the cell, lightly tap the cell with your fingertip to try and remove them.**

- g. Install the cell into the cell holder and tighten slightly.
  - h. Replace the analysis compartment cover and close the front panel.
  - i. Select **Background** from the Unit menu to begin the background measurement.
6. After the background measurement is complete, open the front panel and remove the cover from the analysis compartment.
  7. Remove the cell, and the top stopper from the cell. Empty out the background liquid, being careful so that liquid adhering to the top of the cell does not run down the outer surface of the cell.
  8. Using a lens wipe, dry the top of the cell and the stopper; lay the stopper aside.
  9. Fill the cell with properly dispersed sample.
  10. Replace the top stopper securely, being careful not to allow sample to seep from the cell. If any seepage occurs, wipe away with a lens wipe.
  11. Install the cell into the cell holder and tighten slightly.
  12. Replace the analysis compartment cover and close the front panel.
  13. Select **Sample analysis** from the Unit menu to start the analysis.

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