PARTICLE INSTRUMENTS

Particle Sizers

# Aerosol Instrument Manager® Software

## for Optical Particle Sizer (OPS) Spectrometers

User's Manual

P/N 6004402, Revision A
November 2010

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# Aerosol Instrument Manager® Software

for Optical Particle Sizer (OPS) Spectrometers

User's Manual

# Manual History

The following is a manual history of the Aerosol Instrument Manager Software for Optical Particle Sizer (OPS) Spectrometers User's Manual (Part Number 6004402).

| Revision | Date |
|---|---|
| A | November 2010 |

# Warranty

**Part Number** 6004402 / Revision A / November 2010

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# About This Manual

## Purpose

This is a user's manual for the Aerosol Instrument Manager® Software as it applies to an Optical Particle Sizer (OPS) Spectrometer.

## Related Product Literature

- *Model 3330 Optical Particle Sizer (OPS) Spectrometer Operation and Service Manual* (part number 6004403), TSI Incorporated

## Getting Help

To obtain assistance for this software or to submit suggestions, please contact Particle Instruments:

TSI Incorporated
500 Cardigan Road
Shoreview, MN 55126 USA
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E-mail: technical.service@tsi.com

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TSI values your comments and suggestions on this manual. Please use the comment sheet, on the last page of this manual, to send us your opinion on the manual's usability, to suggest specific improvements, or to report any technical errors.

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TSI Incorporated
Particle Instruments
500 Cardigan Road
Shoreview, MN 55126
Fax: (651) 490-3824
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CHAPTER 1

# Introduction

The Aerosol Instrument Manager® software is used to collect sample data from a TSI instrument and store the sample data in files. You can use the software to display data in graphs and tables, or view statistical information. You can print graphs and tables with the software, export data for use in other applications, and import certain types of data (Optical Particle Sizer log files, for example).

There are a number of ways to navigate within the program. These include selecting items from the main menus, selecting icons from the toolbar, and selecting items from submenus (which you access by right-clicking the mouse button). Specific instructions are provided in the following chapters.

The Aerosol Instrument Manager® software is designed to be used with a variety of different TSI instruments.

- Optical Particle Sizer (OPS) Spectrometers
- Aerodynamic Particle Sizer® (APS™) Spectrometers
- Scanning Mobility Particle Sizer™ (SMPS™) Spectrometers
- Condensation Particle Counters (CPCs)
- Electrical Aerosol Detectors (EADs)
- Aerosol Electrometers

This manual covers the use of the Aerosol Instrument Manager® software with TSI Optical Particle Sizer spectrometers only. For information about software operation with other TSI instruments, refer to the appropriate manual.

This manual assumes you have Microsoft® Windows® XP or Windows® 7 on your computer and that you are familiar with how Windows® operating systems work. If you are not familiar with the Windows® operating system, please refer to the information that came with it before you load and use this program.

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# How This Manual is Organized

This manual describes the Aerosol Instrument Manager® software and includes information such as:

- Requirements for loading and running the software.
- The installation procedure that loads the program onto your computer.
- A "Getting Started" chapter that introduces basic software operations.
- "How to ..." information for using the program to operate and collect data with a specific spectrometer.
- Descriptions of the menus and menu items that are valid when collecting data with an OPS spectrometer or viewing data files from an OPS spectrometer.
- Appendixes that provide reference information associated with program operation.

# Notations/Conventions Used in This Manual

- Throughout this manual when reference is made to "Windows," it implies either Windows® XP or Windows® 7 operating system.
- Bold face type is used to indicate that you should perform the indicated action. For example "select the **File** menu" means that you should use the mouse and click on the menu called File.
- When instructions direct you to select items from a menu, a vertical bar (|) is used to separate the items you should select. For example, "select **File**|**Properties**|**Scheduling**" means you should click on the File menu, then select the Properties item, and then select the Scheduling tab.
- The term "active window" is used to refer to the window that is open on the desktop and is in focus. To verify which window is active, select the **Window** menu and note which item has a checkmark by it. You can make a window active by moving the pointer to that window and clicking the mouse button.

CHAPTER 2

# Installing the Software

This chapter describes the installation requirements for the Aerosol Instrument Manager® software and the installation procedure.

## Installation Requirements

To use this software we recommend a personal computer with the following minimum features, components, and software:

- A Pentium® 586 processor or higher.
- An SVGA color monitor.
- Microsoft Windows® XP or Windows® 7 operating system.
- A hard drive large enough to accommodate Windows, the Aerosol Instrument Manager® software, and data files.

  ***Note**: The amount of disk space required depends on the number of samples you collect, the amount of information collected, and the sampling period. After you have collected a number of samples, you may want to look at the file size to estimate how much storage space you will be using.*
- A CD-ROM drive.
- 2 GB or more of random access memory (RAM).
- A mouse.
- A USB port if you wish to connect directly to the instrument.
- An Ethernet port if you wish to communicate with the instrument over a network.
- A Microsoft® Windows®-compatible printer is optional.

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Microsoft® and Windows® are registered trademarks of Microsoft Corporation.

# Installation

Install the Aerosol Instrument Manager® software as follows:

1. Shut down (exit) all programs/applications on the Windows® desktop.
2. With the computer on and Windows® operating system running, insert the Aerosol Instrument Manager® CD-ROM in your CD drive to run the **autorun.exe** from the CD.
   a. If AutoPlay is enabled on your PC, the setup program will begin automatically and the introduction screen will be displayed on the Windows desktop.
   b. If AutoPlay is not enabled, select **Run** from the **Start** menu and type: `D:\autorun` (where D is the letter corresponding to your CD drive) in the Open box and press **OK**.
3. Follow the instructions as the setup program runs. When setup is complete, you should read the readme.htm file if one is available. This file contains important information that could not be included in this manual. If you decide not to read the file immediately, you can access the file later. It will be installed in the same directory as the application.
4. When the installation program finishes, remove the CD-ROM and store the CD in a safe place for later use.

The setup program creates a directory (folder) called "TSI\Aerosol Instrument Manager" on your hard disk (assuming you accepted the default directory name). The directory contains the required program files and sample data files.

The setup program also creates a new item in the Start Menu called "TSI" and an icon for the Aerosol Instrument Manager® software.

***Note**: Before creating a TSI menu item, the setup program checks for an existing one. If one is present, it adds the Aerosol Instrument Manager® icon only.*

CHAPTER 3

# Getting Started

This chapter is designed to give you an introduction to the basic operation of the Aerosol Instrument Manager® software. Using it, you will:

- Start the program.
- Open an existing file (from the example files provided with the program).
- Change how data is viewed.
- View another sample in the same file.
- Playback (review) data samples in a “slide show” fashion.
- Select a data hot spot.
- Delete/Undelete samples.
- View Multiple Samples at the Same Time.
- Zoom in and zoom out on data in a graph.
- Print information displayed on the desktop.
- Export data to a file.
- Import logged OPS data to an Aerosol Instrument Manager® OPS software file.
- Arrange open windows.
- Quit the program.

## Start the Program

To start the program, proceed as follows:

From the Windows desktop, using the mouse, double-click the Aerosol Instrument Manager icon or press the **Start** menu and select **All Programs|TSI|Aerosol Instrument Manager.**

The Aerosol Instrument Manager® desktop appears as shown in Figure 3-1.

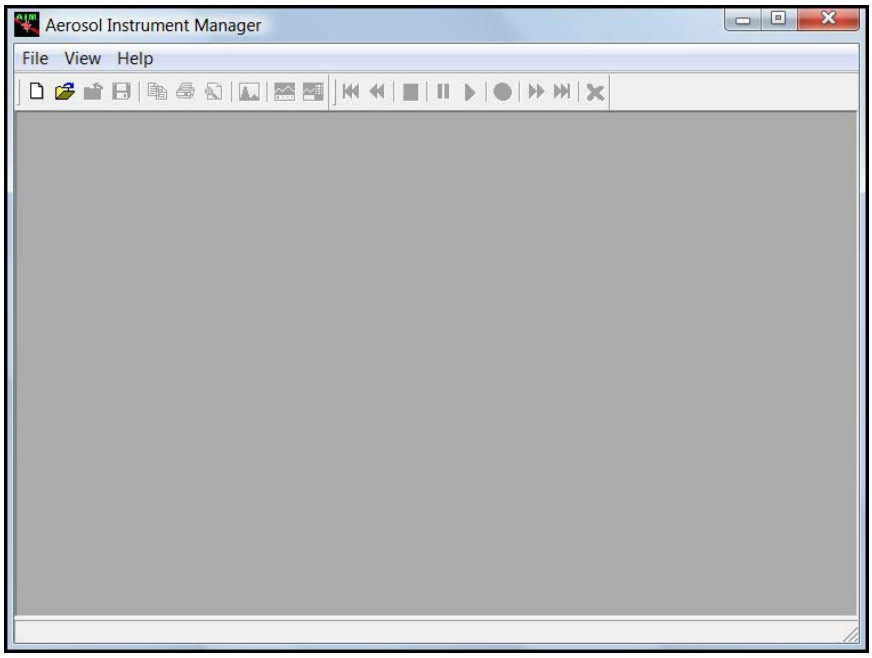



**Figure 3-1**
The Aerosol Instrument Manager Desktop

# Open an Existing File

1. Select **File | Open** or  on the toolbar. The “Open Instrument Associated Data Files” window opens.
2. When the “Open Instrument Associated Data Files” window appears, select the correct extension for the file you want to open in the “Files of type” box. For an OPS, the file extension is .O30 where ‘O’ represents OPS and ‘30’ indicates model 3330.
3. If necessary, browse for the drive/directory where data files are stored. (Example files are included with the program and were installed in the Aerosol Instrument Manager® folder when the program was installed.)
4. Select the data file that you want to open and click **Open**. At least two windows open on the desktop: a window containing a graph of the sample data, and the Samples List window. See Figure 3-2.

***Note**: If the file has been opened before, it may display more than one graph and/or table. The program remembers the windows that were open on the desktop when you last closed the file and reopens them when you access the file again. If the file contains a sequence of samples, you will be asked if you want to open all the files or just the one you originally chose. See Appendix E for information about sequence files.*

*The Samples List window opens whenever you open a data file and remains open on the desktop as long as the data file is open. Closing the Samples List window closes the data file (and all its open windows).*

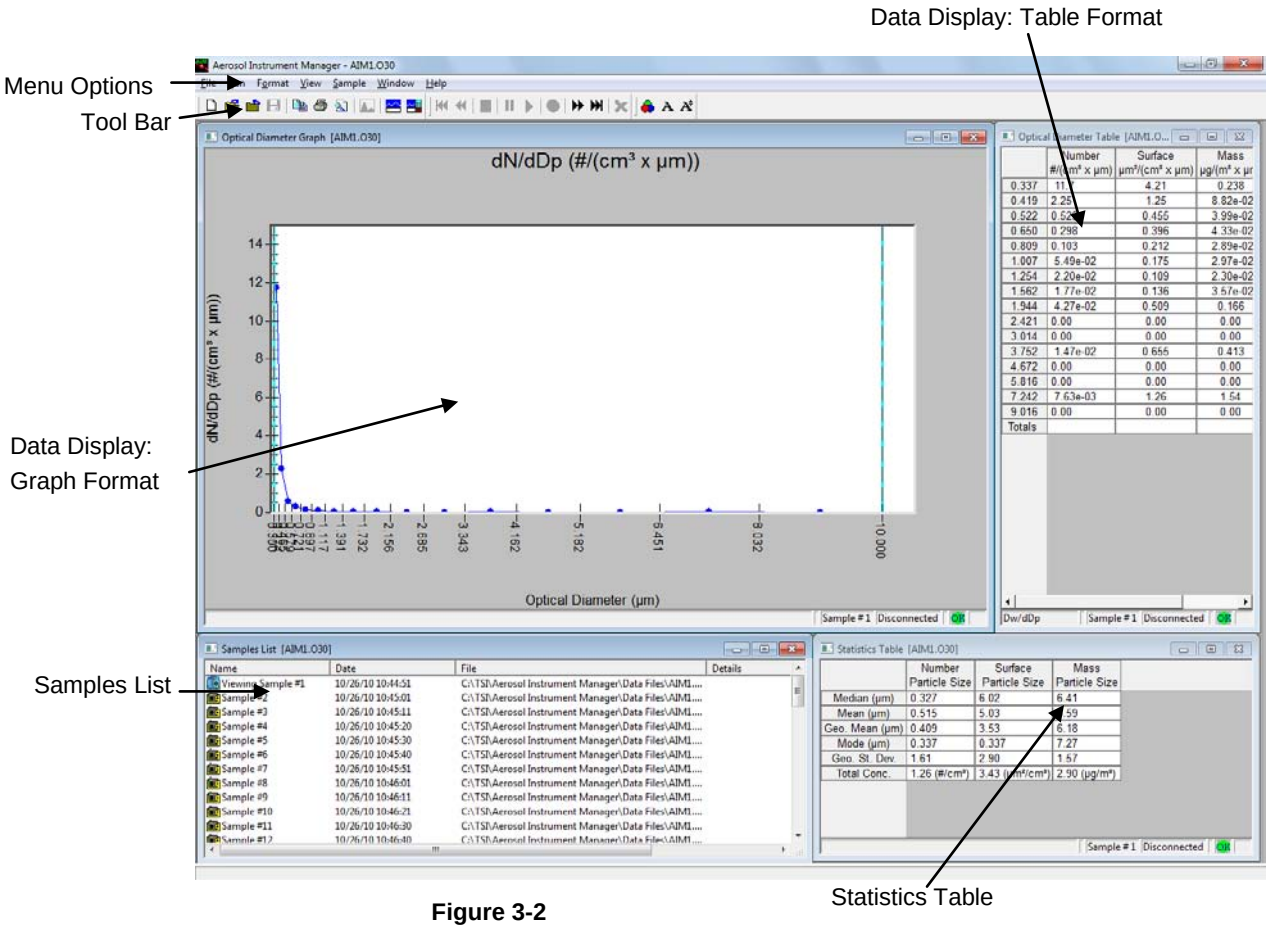



**Figure 3-2**
The Aerosol Instrument Manager Desktop and Selected Displays

# Change How Data is Viewed

You can view Optical Particle Sizer (OPS) data in tables or graphs and in several different formats (for example, data can be viewed by optical diameter, concentration, etc.). The following procedure provides an example of how you can change how data is viewed.

1. Open a sample OPS file as described in "Open an Existing File".
2. With the graph window active on the desktop, open the **View** menu.
3. Use the mouse to select **View | Weight | Number**. Notice the change in how data is displayed. (A checkmark next to one of the menu items means that a window for that selection is already open on the desktop. If you select a menu item that is already checked, the window containing that graph or table is brought to the top of the desktop and becomes the active window.)
4. Experiment with other views by making other windows active and selecting other options from the **View** menu to see how your selections change the data.
5. You can also limit the view to a subset of channels by moving the view boundaries (vertical red dashed lines).

To view a subset of channels:

1. Hold the left mouse button down on the view boundary and move the mouse to drag the line. The two vertical solid blue lines are the minimum and maximum boundaries which cannot be moved.
2. The lower view bound can be moved to the right of the minimum boundary and the upper view bound can be moved to the left of the upper view boundary.

When you use the view boundary lines to select a subset of channels, the table reflects this by replacing the values for the excluded channels with dashed lines and the Statistics table shows statistics based only on the subset of channels.

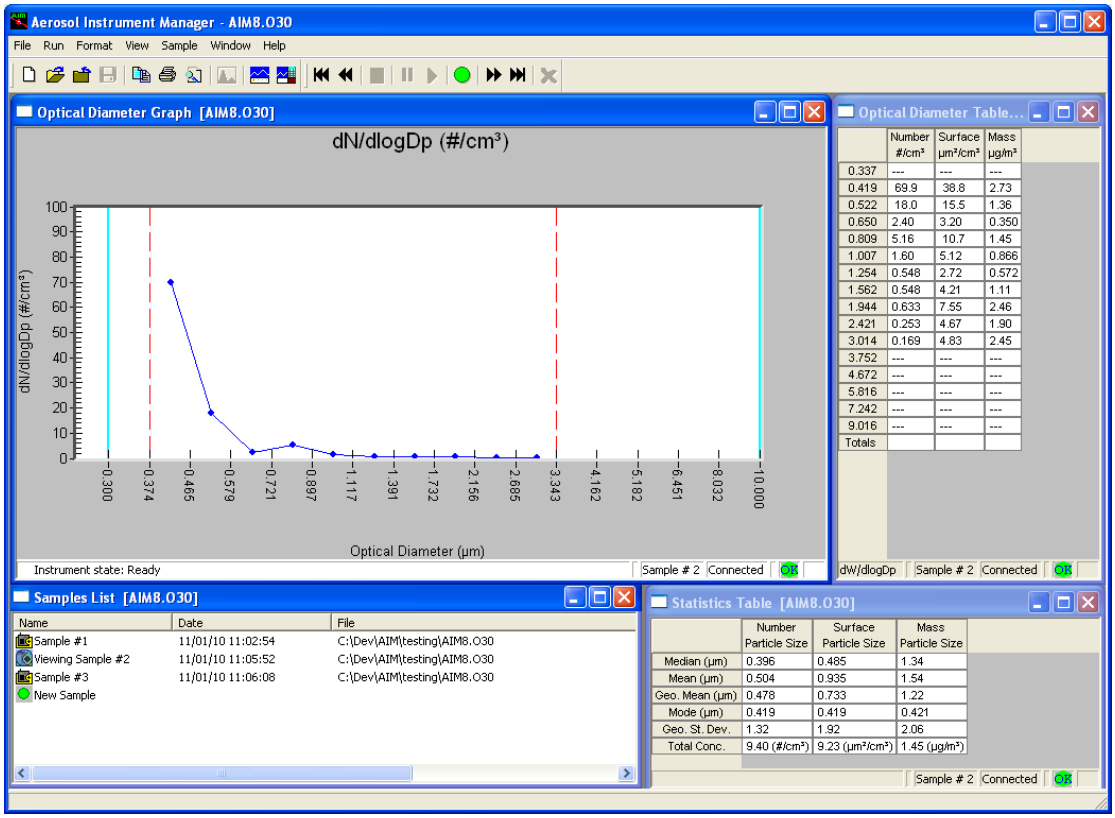



**Figure 3-3**
Use the Graph View Boundary Lines to View a Subset of Channels

# View Another Sample in the Same File

1. To view another sample in an open file, make certain the Samples List window is active and then select the ⏭ icon (go forward one sample) from the toolbar. The data for the next sample of the currently active file replaces the data in all the open windows.
2. You can continue to step through the samples by pressing the ⏭ icon until you reach the last sample.

   The sample currently displayed in the open window is highlighted in the Samples List window.

   Another method of changing the sample that is displayed in the open window on the desktop is by selecting the icon for that sample from the active Samples List window.

You can use the following icons to display other samples:

 First Sample. Advance to the first sample.

 Previous Sample. Advance to the previous sample.

 Next Sample. Advance to the next sample.

 Last Sample. Advance to the last sample.

# Playback (Review) Data Samples

You can display sample graphs and tables in a slide show fashion (to preview sample results or compare sample differences) as follows:

1. From the Samples List window, select the samples you want to play back using one of the following actions:

   Select **Sample | Select All,** to play back all samples.

   *or*

   Select individual samples using the mouse and the Ctrl key to highlight those samples you want to see. (You must select at least two samples.)

   *or*

   Select a group of samples by holding down the left mouse button and moving the mouse to "rubber band" (outline) the samples you want to select.

   ***Note:*** *The Playback menu items and toolbar icons are only enabled when the Samples view is the active view.*

2. When you have selected the samples you want to view, select **Playback | Play**. The setup box shown in Figure 3-4 appears.

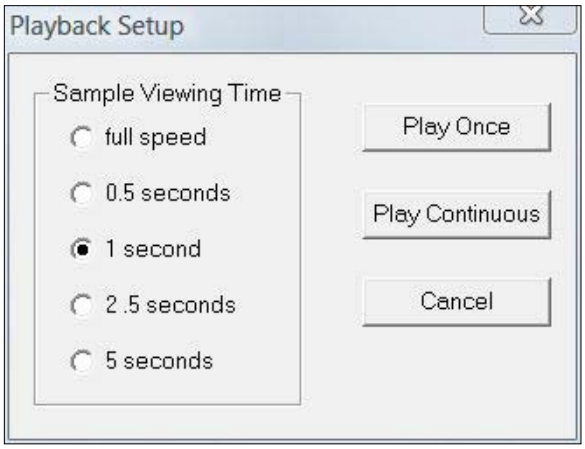



**Figure 3-4**
Playback Setup Dialog Box

3. Select the sample viewing time and whether you want the samples displayed once or continuously. Playback begins immediately. For better viewing, it may be necessary to minimize the Samples List window.
4. You can pause the playback at any time by selecting **Playback | Pause**. Select **Playback | Play** to continue playback where you left off. You can stop playback at any time by selecting **Playback | Stop**. When you stop playback, you cannot restart it. Use **Playback | Pause** and **Playback | Play** if you want to stop and start playback.

You can also control playback by using icons on the toolbar. The icons perform the following operations:

 Stop. Stop playback.

 Pause. Pause playback on current sample.

 Start. Start playback or restart playback.

# Select a Data Hot Spot

When a graph is open on the desktop, you can find the value of a data point as follows:

1. Position the pointer on the bar, line, or peak (depending on the type of graph that is active). The pointer becomes a pointing hand.
2. Press the left mouse button to display the values. Figure 3-5, shows how the data values are displayed for an OPS spectrometer (optical diameter and raw counts).

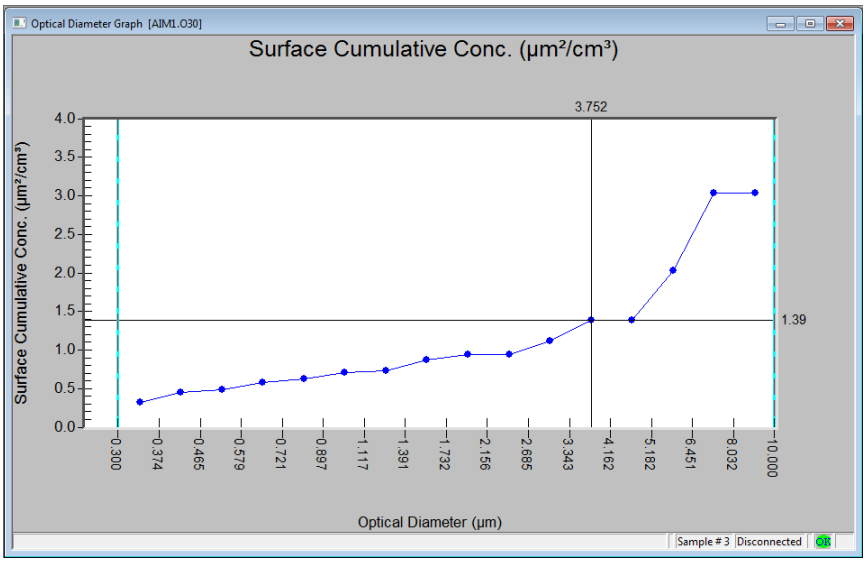



**Figure 3-5**
Use the Mouse to Directly View Data Values

***Tip:*** *After you have a data hot spot selected, use the arrow keys or the ">" and "<" keys to move the cursor right or left (from one value to the next), or grab the vertical bar and drag it to another location. Refer to Appendix B for a list of other keys or key combinations you can use to navigate and perform operations without using the mouse.*

# View Multiple Samples at the Same Time

You can view up to 10 samples at the same time on the graph and tables by selecting the samples as follows. Hold the **G** key down while you click the desired samples with the left mouse button in the Samples List view. When you have finished selecting the group samples, release the **G** key. The samples will be displayed together on the graph and in the tables. When you have finished viewing a group, select a single sample (without pressing the **G** key) and that sample will be displayed instead of the group.

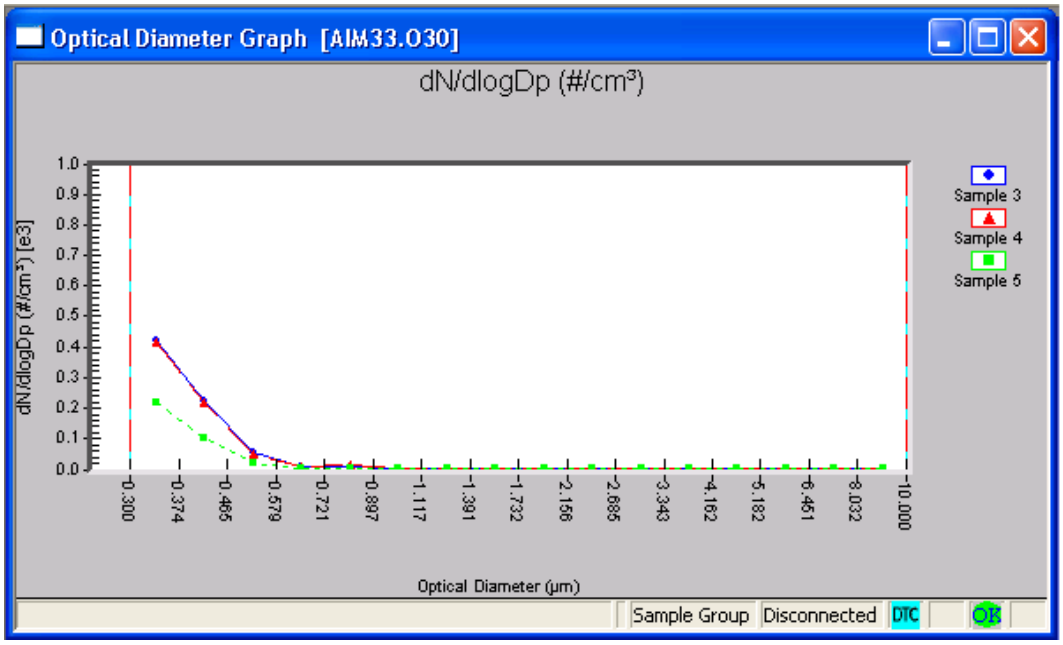
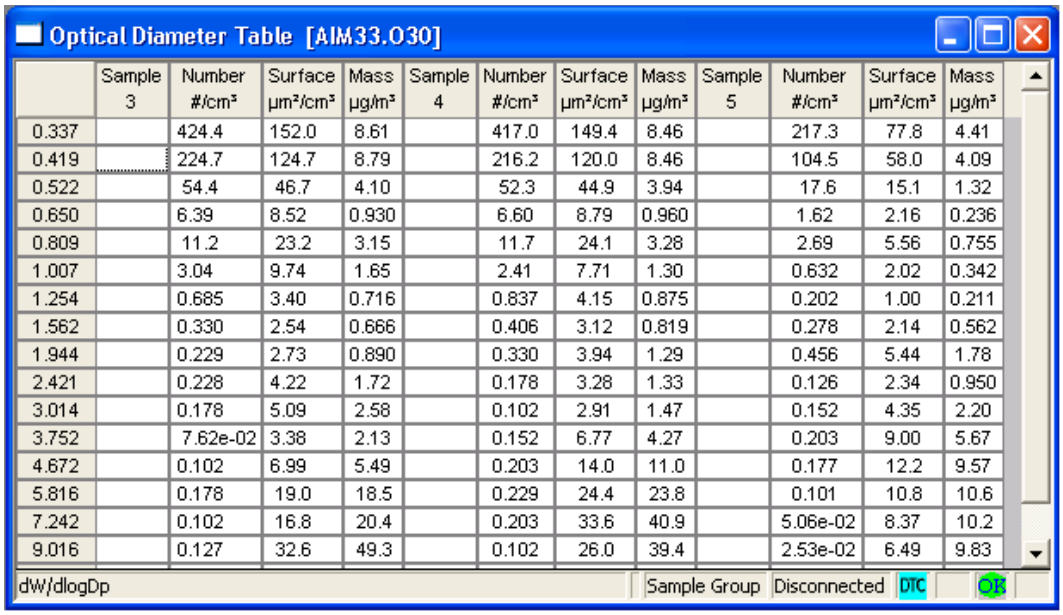



**Figure 3-6**
Three Samples Displayed Together on the Optical Diameter Graph




| | Sample 3 | Number #/cm³ | Surface µm²/cm³ | Mass µg/m³ | Sample 4 | Number #/cm³ | Surface µm²/cm³ | Mass µg/m³ | Sample 5 | Number #/cm³ | Surface µm²/cm³ | Mass µg/m³ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.337 | | 424.4 | 152.0 | 8.61 | | 417.0 | 149.4 | 8.46 | | 217.3 | 77.8 | 4.41 |
| 0.419 | | 224.7 | 124.7 | 8.79 | | 216.2 | 120.0 | 8.46 | | 104.5 | 58.0 | 4.09 |
| 0.522 | | 54.4 | 46.7 | 4.10 | | 52.3 | 44.9 | 3.94 | | 17.6 | 15.1 | 1.32 |
| 0.650 | | 6.39 | 8.52 | 0.930 | | 6.60 | 8.79 | 0.960 | | 1.62 | 2.16 | 0.236 |
| 0.809 | | 11.2 | 23.2 | 3.15 | | 11.7 | 24.1 | 3.28 | | 2.69 | 5.56 | 0.755 |
| 1.007 | | 3.04 | 9.74 | 1.65 | | 2.41 | 7.71 | 1.30 | | 0.632 | 2.02 | 0.342 |
| 1.254 | | 0.685 | 3.40 | 0.716 | | 0.837 | 4.15 | 0.875 | | 0.202 | 1.00 | 0.211 |
| 1.562 | | 0.330 | 2.54 | 0.666 | | 0.406 | 3.12 | 0.819 | | 0.278 | 2.14 | 0.562 |
| 1.944 | | 0.229 | 2.73 | 0.890 | | 0.330 | 3.94 | 1.29 | | 0.456 | 5.44 | 1.78 |
| 2.421 | | 0.228 | 4.22 | 1.72 | | 0.178 | 3.28 | 1.33 | | 0.126 | 2.34 | 0.950 |
| 3.014 | | 0.178 | 5.09 | 2.58 | | 0.102 | 2.91 | 1.47 | | 0.152 | 4.35 | 2.20 |
| 3.752 | | 7.62e-02 | 3.38 | 2.13 | | 0.152 | 6.77 | 4.27 | | 0.203 | 9.00 | 5.67 |
| 4.672 | | 0.102 | 6.99 | 5.49 | | 0.203 | 14.0 | 11.0 | | 0.177 | 12.2 | 9.57 |
| 5.816 | | 0.178 | 19.0 | 18.5 | | 0.229 | 24.4 | 23.8 | | 0.101 | 10.8 | 10.6 |
| 7.242 | | 0.102 | 16.8 | 20.4 | | 0.203 | 33.6 | 40.9 | | 5.06e-02 | 8.37 | 10.2 |
| 9.016 | | 0.127 | 32.6 | 49.3 | | 0.102 | 26.0 | 39.4 | | 2.53e-02 | 6.49 | 9.83 |

**Figure 3-7**
Three Samples Displayed Together on the Optical Diameter Table

Statistics Table [AIM33.030]

| | Number Particle Size | Surface Particle Size | Mass Particle Size |
|---|---|---|---|
| Sample 3 | | | |
| Median (µm) | 0.337 | 0.436 | 6.91 |
| Mean (µm) | 0.397 | 1.67 | 5.91 |
| Geo. Mean (µm) | 0.384 | 0.728 | 3.95 |
| Mode (µm) | 0.337 | 0.337 | 0.338 |
| Geo. St. Dev. | 1.24 | 3.03 | 3.18 |
| Total Conc. | 69.2 (#/cm³) | 43.9 (µm²/cm³) | 12.3 (µg/m³) |
| Sample 4 | | | |
| Median (µm) | 0.337 | 0.447 | 6.71 |
| Mean (µm) | 0.399 | 1.89 | 5.85 |
| Geo. Mean (µm) | 0.384 | 0.816 | 4.18 |
| Mode (µm) | 0.337 | 0.337 | 0.338 |
| Geo. St. Dev. | 1.25 | 3.23 | 2.90 |
| Total Conc. | 67.6 (#/cm³) | 45.4 (µm²/cm³) | 14.4 (µg/m³) |
| Sample 5 | | | |
| Median (µm) | 0.337 | 0.431 | 5.16 |
| Mean (µm) | 0.390 | 1.67 | 4.94 |
| Geo. Mean (µm) | 0.376 | 0.782 | 3.48 |
| Mode (µm) | 0.337 | 0.337 | 0.338 |
| Geo. St. Dev. | 1.23 | 3.08 | 2.86 |
| Total Conc. | 33.0 (#/cm³) | 21.2 (µm²/cm³) | 5.97 (µg/m³) |

Sample Group | Disconnected | DTC | OK

**Figure 3-8**
Three Samples Displayed Together in the Statistics Table

# Delete/Undelete Samples

To delete samples from a file, you must first mark them for deletion and then either **Close** or **Save** the file. The following procedures will permanently delete samples from a file:

**Mark samples for deletion as follows:**

1. Select the sample you want to delete from the Samples List window (you can select multiple samples).
2. Select **Sample | Delete/Undelete Sample** or  on the toolbar. The samples will be shown as “Deleted.” However, they will not be permanently removed from the file until you **Close** or **Save** the file.

**Save the file and permanently delete all samples marked for deletion:**

1. With at least one sample marked for deletion in the active file, select **File | Save**. You will get a message stating: "Some samples have been marked for deletion. Do you want them permanently removed?" Click **Yes** to remove them or **No** to keep them.
2. Select **Yes**. The samples marked for deletion are permanently deleted.

   ***Note:*** *If you attempt to close all the windows for the file or exit the program without saving the file, you will get a message asking whether you want to save changes to the file. Respond **Yes** and you will get the same message stating "Some samples have been marked for deletion. Do you want them permanently removed?" Respond **Yes** to delete the marked samples and **No** to close the file without deleting them.*

# Zoom In and Out on Data in a Graph

You can zoom in on data displayed in a graph as follows:

1. Use the mouse to position the cursor (pointer) at one corner of the area you want enlarged.
2. Press down on the left mouse button and drag the mouse to the opposite corner of the data you want enlarged.
3. Release the left mouse button. The area you selected is enlarged.
4. You can continue to zoom further by repeating steps 1 through 3.

To Unzoom, select **Format | Undo Zoom** or 

on the toolbar. The enlarged area is returned to normal view.

# Print Information Displayed on the Desktop

You can print the information displayed in the active window on the desktop as follows (you must have a printer properly installed):

1. With a graph or table window active on the desktop, select **File | Print Preview** or  .

2. Review that what you see in the print preview window is what you want to print (an example is shown in Figure 3-9), and then select **Print** from the Preview box. The contents of the window are sent to your printer.

   You can immediately print a window without previewing it by selecting **File | Print** or  from the toolbar.

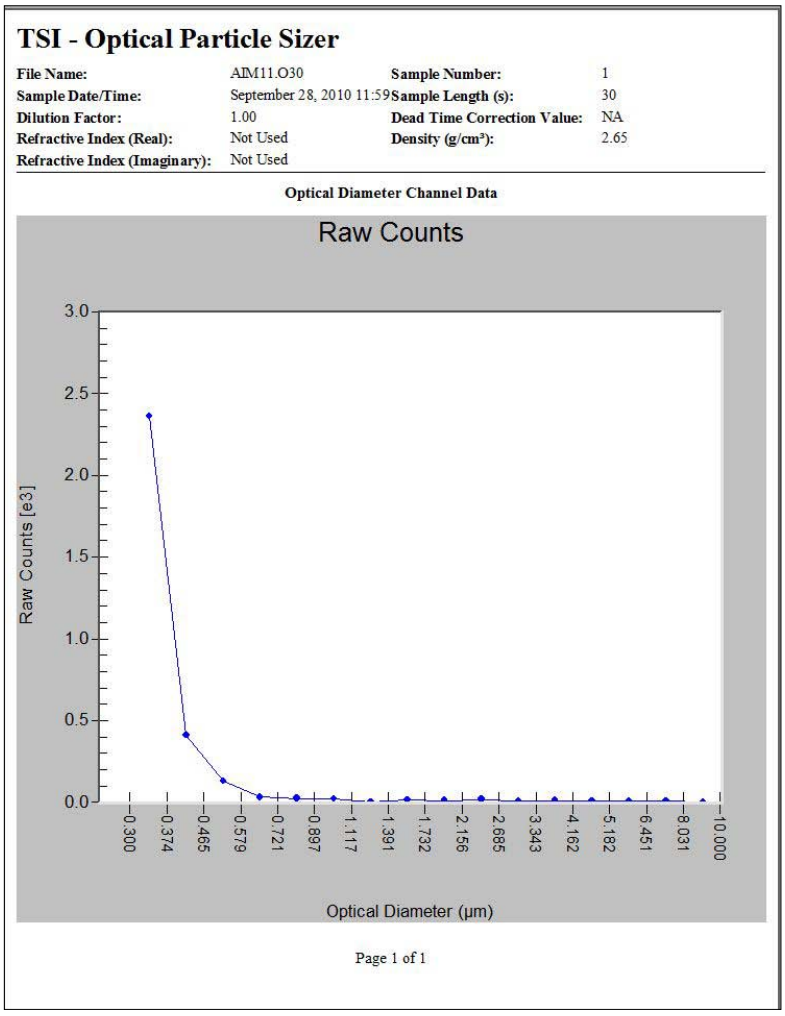



**Figure 3-9**
Print Preview

# Export Data to a File

You can export data from an OPS Aerosol Instrument Manager® software file in two ways: manually or automatically.

## Manually Export Data to a File

To manually export data (either a single sample of the file or multiple samples of the file) for use in another program (such as Microsoft Excel®):

1. Select the sample or samples to be exported as follows:

   To export data from a single sample, display the sample data in an active window on the desktop.

   To export data from multiple samples, select (highlight) the samples you want to export from the Samples List window.

2. Select **File|Export**. An Export Options box appears (Figure 3-10).

3. Select the type of data you want to export as well as the format you want to export the data in.

   Data can be exported as an Excel file (.xls), a comma separated variable file (.cvs), or a text file (.txt) and you can select from three delimiters: tab, comma, or semicolon. The orientation of data can be either column or row.

4. After selecting the export options, press **OK**.

5. Select the drive/directory you want to export the data to and enter a filename. The system automatically adds the correct file extension.

6. Press **Save**.

®Excel is a registered trademark of Microsoft Corporation.

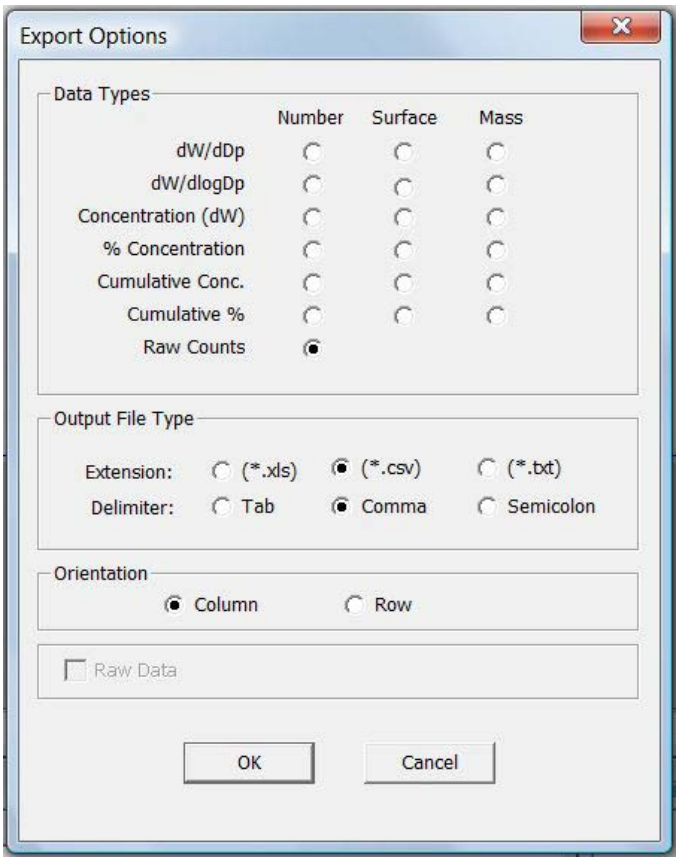



**Figure 3-10**
The Export Options Box

**7.** Figure 3-11 illustrates how an exported *.txt file is formatted for an OPS spectrometer.

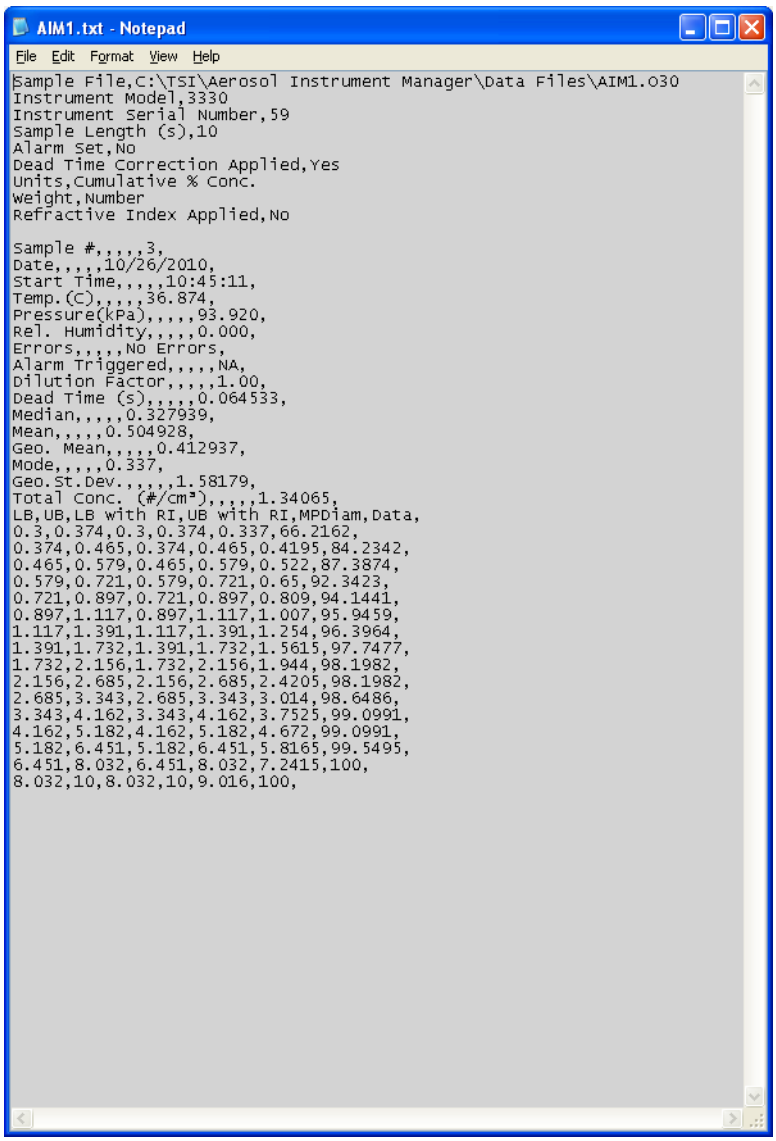



**Figure 3-11**
A Sample Export File

## Automatically Export Data to a File

To export data automatically to a file for use in another program (such as Microsoft Excel®):

1. Establish a connection to the OPS spectrometer by choosing **File | New**, or **File | Open** followed by **Run | Connect to the OPS**.
2. Select **Run | Auto Export** before you begin to collect data. Select the type of data you want to export as well as the format you want to export the data in, using the Export Parameters dialog box (see Figure 3-10). Data will be exported as it is collected.
3. Select **Run | Start Data Collection.** The data is exported to the file as it is collected.

# Import Logged Data into an Aerosol Instrument Manager® OPS Software File

You can save data from the OPS instrument to a log file on a USB flash memory stick and that log file can then be imported into Aerosol Instrument Manager® software where a new Aerosol Instrument Manager® OPS software data file is created. When you transfer a log file to the computer where Aerosol Instrument Manager® software is installed, make sure you also transfer the AIM.bin file that is also saved to the USB flash memory stick. Aerosol Instrument Manager® software will read this file as well as the log file that contains the data. Following are the Aerosol Instrument Manager® software instructions for importing a log file.

Select **File | Import | OPS 3330 Log Files...** to display the Import OPS Log File dialog.

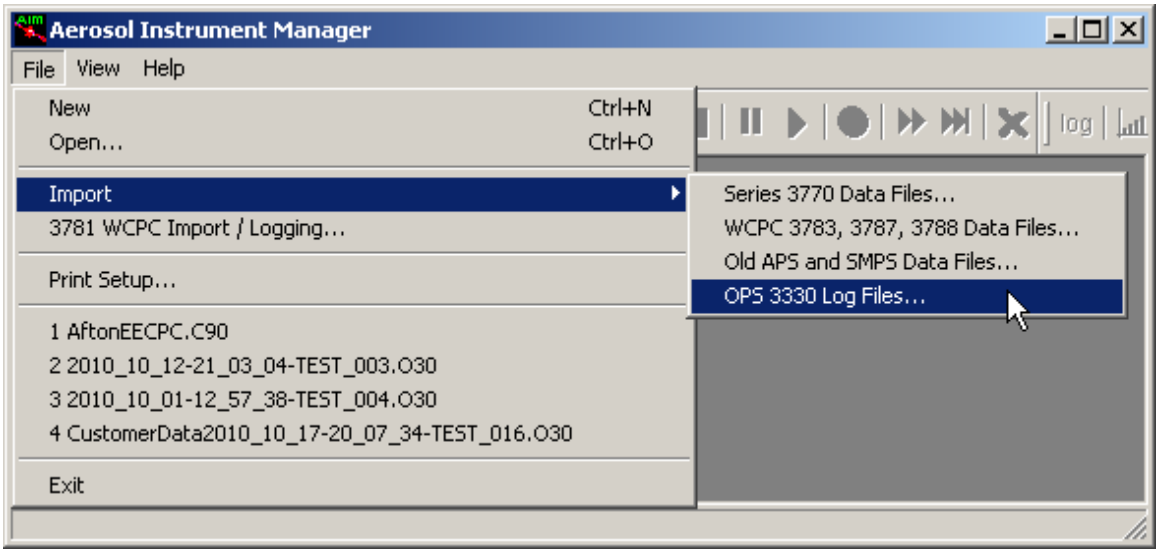



**Figure 3-12**
Import Logged Data

1. On the dialog, click the browse button ... to search for and select the log file. Log files use the file extension ".csv".
2. A suggested pathname for the Aerosol Instrument Manager® OPS software data file based on the original log filename is displayed in step 2. If you wish to change it, click the **Save As** button to browse for a different directory and enter a different filename.
3. Click the **Import** button to import the data from the log file into the new Aerosol Instrument Manager® OPS software file. Click the **Close** button to close the Import OPS Log File dialog. The Aerosol Instrument Manager® OPS software file will be opened in Aerosol Instrument Manager® software.

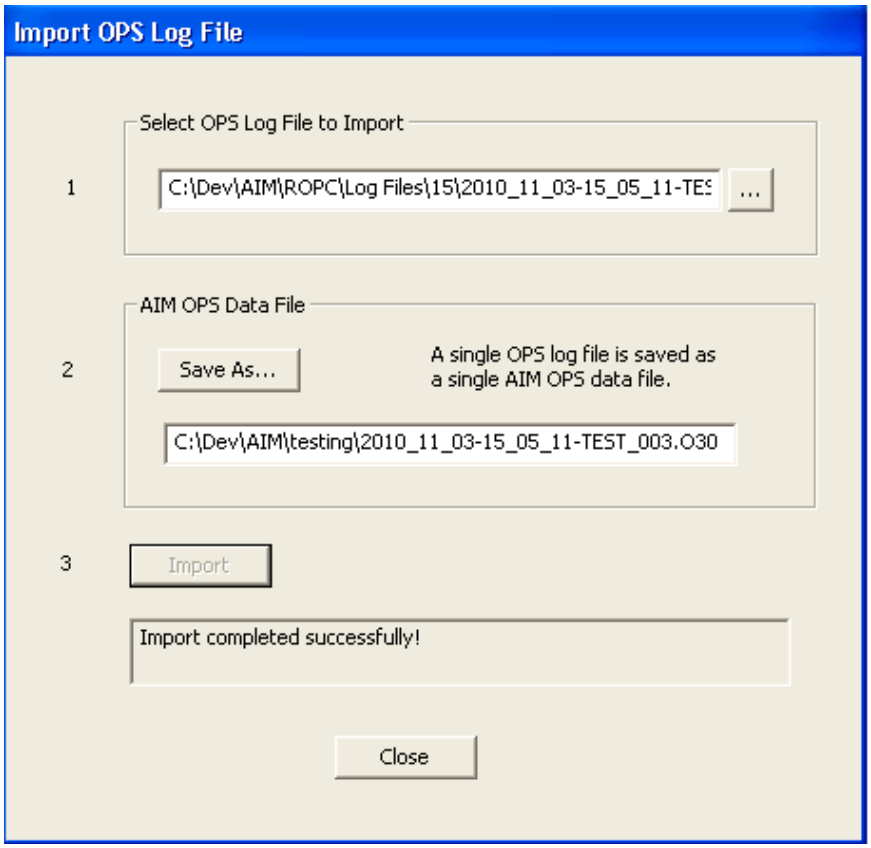



**Figure 3-13**
Import OPS Log File

# Arrange Open Windows

When you have several windows open on the desktop it is helpful to arrange them for easier viewing.

To arrange windows, select an item from the **Window** menu. You can arrange windows on your desktop horizontally, vertically, have them cascade, or arrange them in a predetermined auto-fit layouts. Refer to your Windows® documentation for examples and more information for tile horizontal, tile vertical, and cascade layouts. Press the button (or **Ctrl+L**) in the toolbar for the four-pane layout or press the button (or **Ctrl+K**) for the two-pane layout as shown in Figure 3-14 for a spectrometer file.

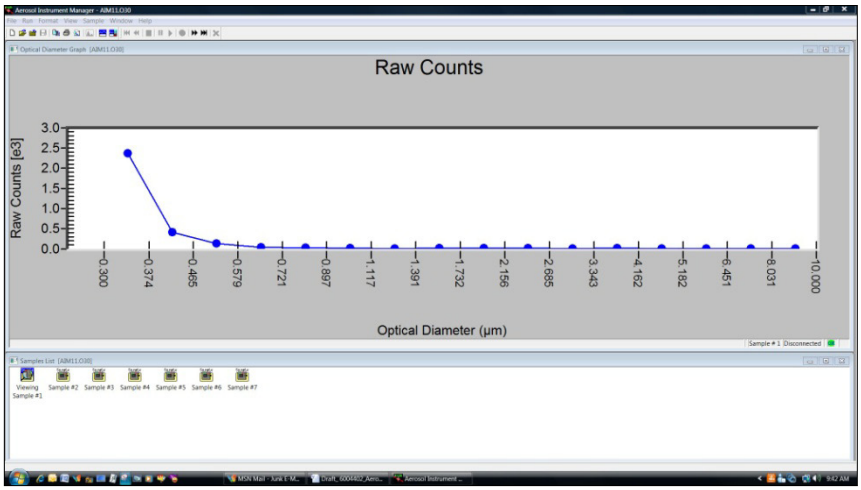



**Figure 3-14**
Two-Pane Layout of an OPS File

All of the program windows that are currently open on the desktop are listed at the bottom of the **Window** menu under the **Close All** item. To make a window active and bring it to the top of all windows, select the name of the window from the list of open windows.

# Quit the Program

To end the program, select **File | Exit**. All windows and files open on the desktop are closed. If you have made changes to a file and have not yet saved it, you will be prompted to do so.

CHAPTER 4

# Software Procedures

Before using the information in this chapter, read Chapter 3. That chapter provides getting started information to help you understand the basics of how the program works.

The subsections of this chapter provide:

- "How To..." information for: collecting sample data with an Optical Particle Sizer (OPS) spectrometer, setting up properties for an OPS, and so on.
- A description of all menus and menu items available when using the OPS spectrometer or viewing OPS data files.

## How To Collect Sample Data

There are three steps for collecting sample data from an OPS spectrometer.

- Step A: Open a new OPS file
- Step B: Review/change parameters
- Step C: Start data collection

***Note:*** *You can append OPS sample data to an existing file. Refer to "Append Sample Data to an Existing OPS File" below.*

Before you begin, make certain you have connected the TSI® spectrometer to the computer and the instrument is running. Refer to the appropriate hardware instruction manual if necessary.

### Step A: Open a New OPS File

Select **File | New** or  on the toolbar. The **Open Instrument Associated Data Files** dialog box (Figure 4-1) opens on your desktop.

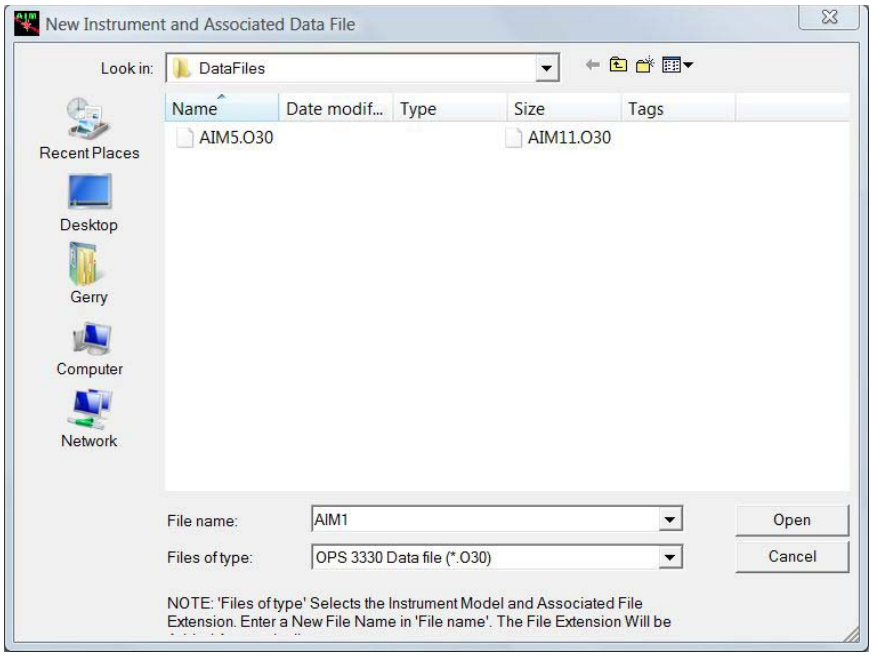



**Figure 4-1**
Select an OPS Filename When you Open a New File

Before you can begin collecting data, you must select a filename (and, optionally, a location other than the Aerosol Instrument Manager® folder). The default name will be “AIM1” for the first new file during this session, “AIM2” for the second new file and so on. You can accept the default name or enter any name you choose.

| I M P O R T A N T |
| --- |
| Verify that the “Files of Type” box indicates the correct extension for the spectrometer you are using (.O30). You do not need to enter an extension in the file name box. It will be assigned automatically. |

After you enter a filename (or if you accept the default name) press the **Open** button.

When you create a new file, the Properties dialog opens with the “Communication Settings” page on top as shown in Figure 4-2.

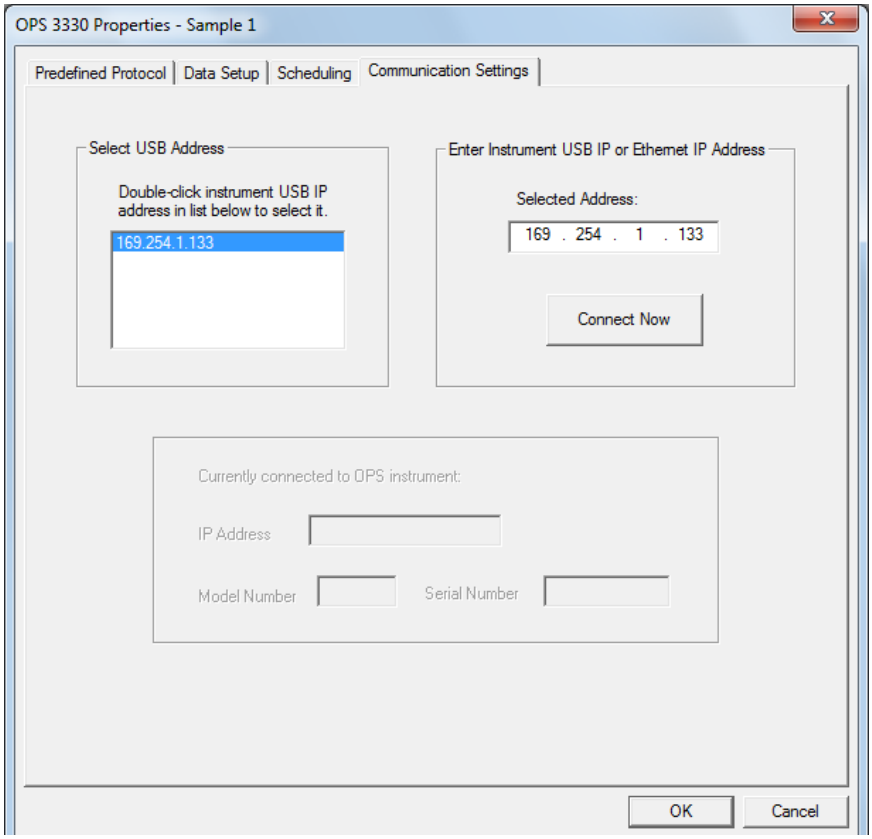



**Figure 4-2**
Communication Settings Tab

You can enter an IP address in the IP Address section whether the instrument is connected to the computer with a USB cable or you are connecting to the instrument over a network. If the instrument is connected to the computer with a USB cable, the software automatically detects the IP address of the instrument and displays it in the window in the “Select USB Address” section. The first address in the list is automatically selected. To select an address in the list, double click on that address. The selected address appears in the IP Address box. If communicating to an instrument through a network, you need to manually enter the Ethernet IP address in the “Select USB Address” box.

Click **Connect Now** to connect to the instrument.

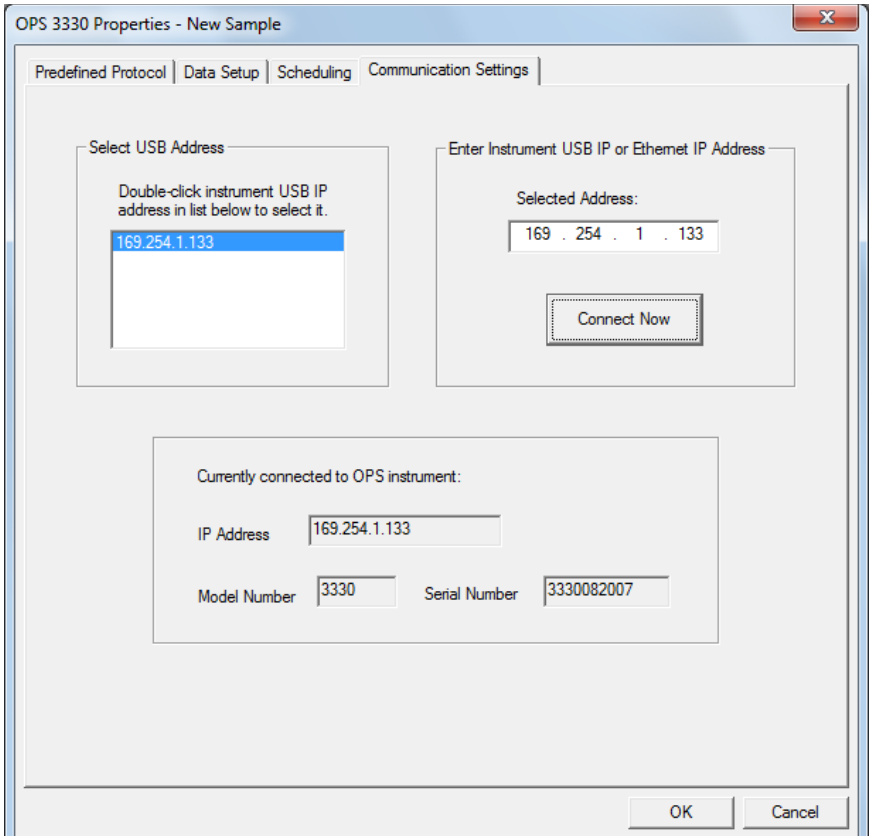



**Figure 4-3**
Select the Instrument Address from the Communications Settings Tab

If you get the following error message, verify the connection to the instrument and the IP address, then press **OK**. This will reopen the Properties dialog box.

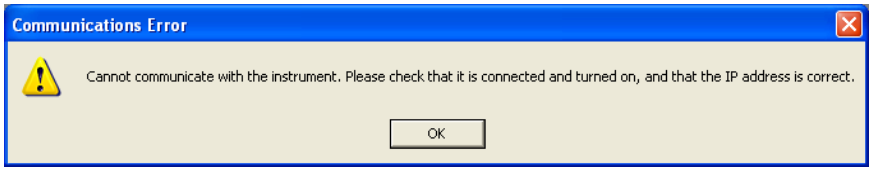



**Figure 4-4**
Communications Error

Verify the connection to the instrument. The display on the spectrometer should indicate “Remote Control.”

## Step B: Review/Change/Set Up Spectrometer Properties

Before you begin sampling, you may want to review the other tabs on the Properties dialog to verify things such as scheduling, data settings, and so on.

View the various tabs of the Properties dialog to review each setting. Refer to "How To Set Up Properties for an OPS Spectrometer" later in this chapter.

Once you have set up the parameters, or verified they are correct, close the Properties dialog box and continue with step C.

## Step C: Start Data Collection

Once you close the properties dialog, data collection begins at the "Start At Time" you set on the Scheduling dialog or immediately after you do one of the following:

- Select **Run | Start Data Collection** from the menu.
- Click  on the toolbar.
- Double-click the New Sample icon in the Samples List window.

When the program begins collecting sample data, the data is displayed in the windows that are open on the desktop.

***Note:*** *When you start collecting OPS data with the computer, the display menu of the OPS 3330 spectrometer is locked. This prevents inadvertent changes to the properties you have set for sampling.*

As each sample finishes, the data for the sample is stored and a new sample begins. When the last sample finishes, sampling stops, but the windows remain open.

To stop data collection before all the samples are collected, do one of the following:

- Select **Run | Finish Current Sample**. Data collection stops after the current sample finishes.

  *or*
- Select **Run | Abort Current Sample** or  on the toolbar to stop data collection immediately. When you select **Abort Current Sample**, the data collected for the current incomplete sample is discarded.

# How To Set Up Properties for an OPS Spectrometer

With an OPS data file active on the desktop, access the Properties dialog box by selecting **File | Properties** or **Run | Properties** (or **Ctrl+R**).

***Note:*** *An OPS window must be active on the Aerosol Instrument Manager® desktop to access the OPS Properties menu item.*

The properties displayed in the Properties dialog box are either:

- The initial default properties as set by TSI or
- The default properties set by a user who selected **File | Save Properties as Default** after making changes to the Properties dialog box.

***Note:*** *If you want to use the same settings the next time you access the properties dialog, remember to select* ***File | Save Properties as Default*** *after you have completed the Properties dialog.*

The Properties dialog box contains four tabs: Predefined Protocol, Data Setup. Scheduling, and Communications Settings.

The following paragraphs describe the settings for each tab of the Properties dialog box.

## Predefined Protocol Tab

The Predefined Protocol tab, Figure 4-5, lets you select a protocol to use for sampling.

You can select any of the existing (predefined) protocols, save and load the current settings, or use the current settings (no predefined protocol).

**To use a predefined protocol**: Highlight the name of the protocol in the list of predefined protocols and press **LOAD**. The software reads the contents of the Predefined Protocol file and uses those values to make the selections on the tabs of the Properties dialog. The protocol you selected is displayed in the “Currently using Predefined Protocol” box.

**To create a new protocol using the current settings:** Press **SAVE**. Then enter a name for the new protocol and press **OK**. The new protocol will be listed in the Predefined Protocols list. The file is saved in a subdirectory of the install directory named Protocol Files.

**To delete a protocol:** Highlight the name of the protocol in the list of predefined protocols and press **DELETE**. A window appears to confirm your action. Press **Yes** to delete the protocol; press **No** to cancel deletion. The protocol you selected is removed from the Predefined Protocols list. You cannot delete the predefined protocols that were provided with the software.

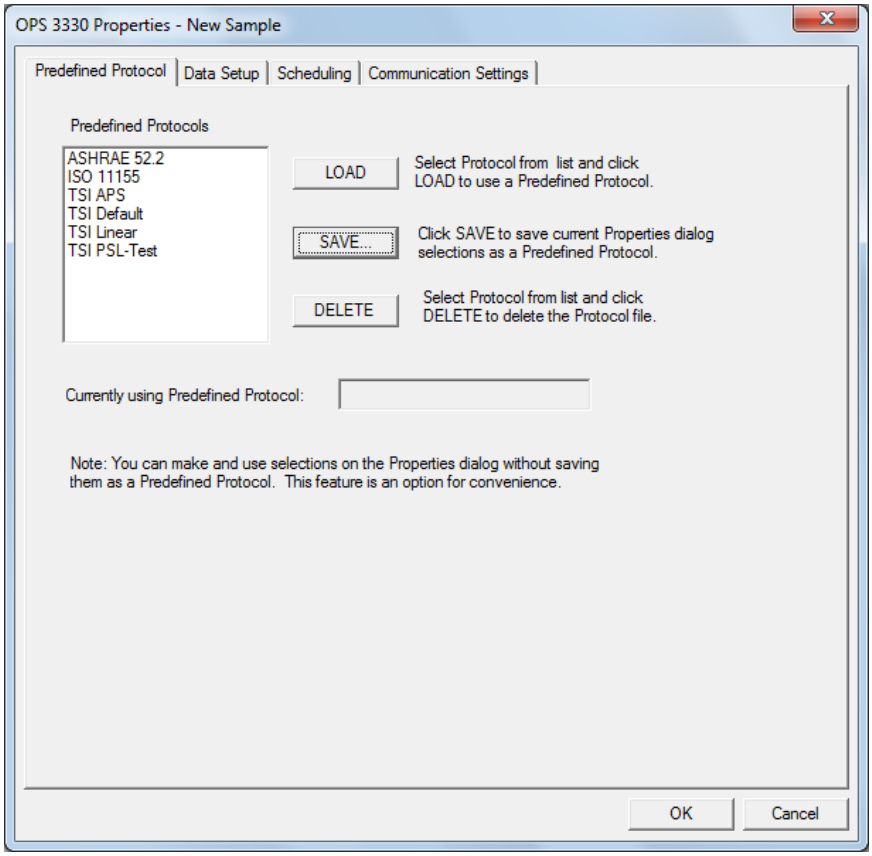



**Figure 4-5**
Predefined Protocol Tab

**Table 4-1**
Descriptions of the Predefined Protocol Parameters for an OPS Spectrometer

| Setting | Description |
|---|---|
| Predefined Protocols | List of protocols that have already been defined. |
| LOAD | Loads the highlighted predefined protocol. |
| SAVE | Saves the current settings as a predefined protocol. |
| DELETE | Delete the highlighted predefined protocol. |
| Currently using “Predefined Protocol” | Identifies the name of the predefined protocol currently in use. Will be blank if you are not using a predefined protocol. |

## Data Setup Tab

The Data Setup tab lets you set up channels, set the alarm function, specify the units displayed for temperature and pressure and include raw data, use dilution factor, and use dead time correction.

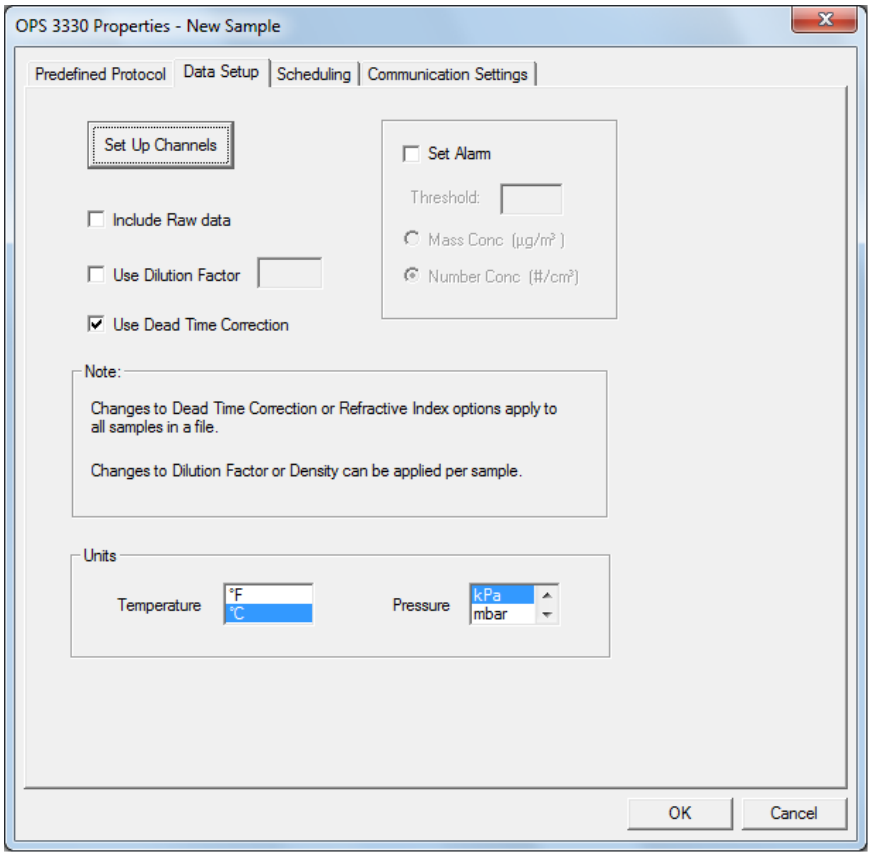



**Figure 4-6**
Data Setup Tab of the Properties Dialog Box

**Table 4-2**
Descriptions of the Data Setup Parameters for an OPS Spectrometer

| Setting | Description |
|---|---|
| Set Up Channels | Displays the Channel Setup dialog (see below). |
| Include Raw Data | Includes raw data values in the sample file. |
| Use Dilution Factor | Lets you specify a dilution factor that will be used in calculating concentration. |
| Use Dead Time Correction | Activates dead time correction to adjust for particle coincidence effect. See Appendix D. |
| Set Alarm | Threshold; Mass Conc or Number Conc. |
| Units | Select the units you prefer for viewing temperature and pressure. |

## Channel Setup

The Channel Setup dialog lets you select the number of channels you want to use and the boundaries of the channels.

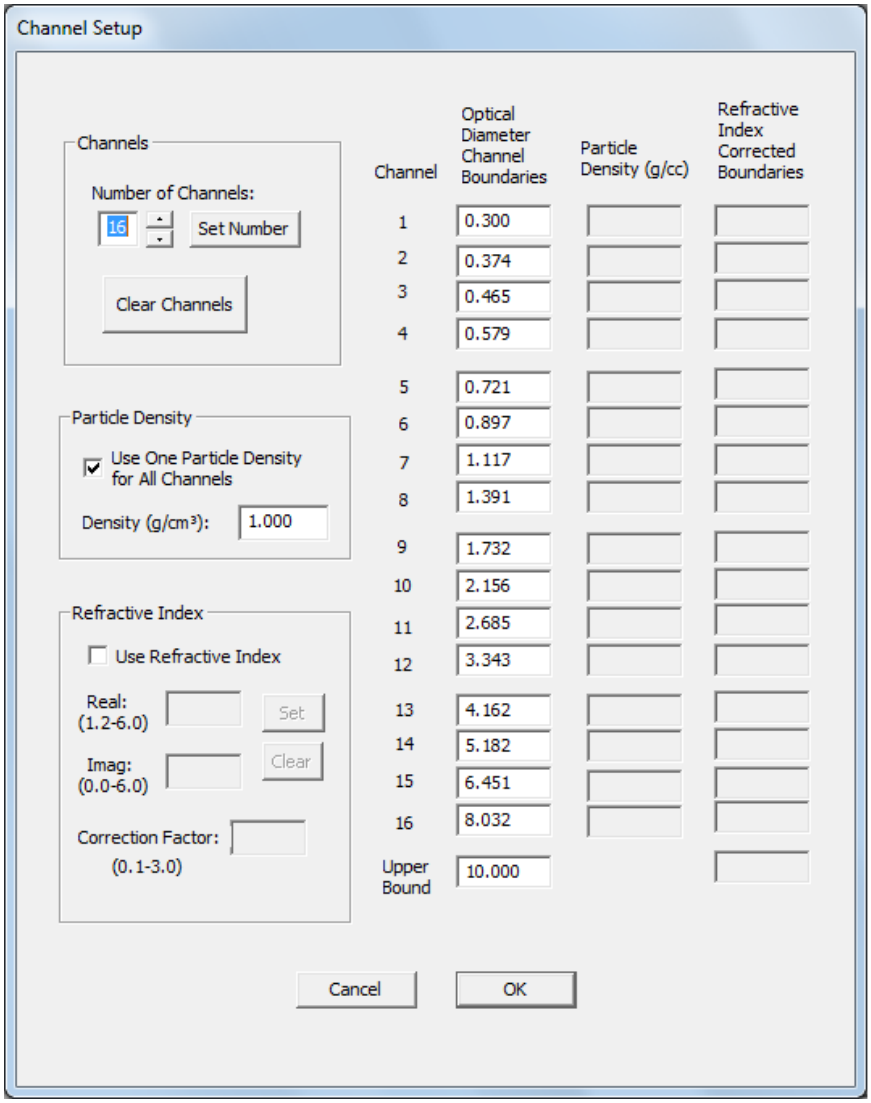



**Figure 4-7**
Channel Setup dialog of the Properties Dialog Box

Select the number of channels you want to use and the boundaries of the channels. The channels must be contiguous and cannot overlap, so the upper bound of one channel is the lower bound of the adjacent channel. The minimum lower bound is 0.3 microns and the maximum upper bound is 10 microns. They refer to optical diameters.

To ensure meaningful measurement, each channel's size range is restricted based upon the instruments resolution.

In the Particle Density box, you can select to enter a single particle density value or you can enter a particle density for each channel.

In the Refractive Index box, you can enter a refractive index if desired. If you enter a refractive index, new channel bounds are calculated based on the refractive index and the original channel boundaries. The refractive index is a complex number that has a real and an imaginary part.

If the Refractive Index is not available to edit you may have to connect to an instrument.

## Scheduling Tab

The Scheduling tab lets you select the number of samples, the length of each sample, how often samples are collected, and the start time for the sample. You cannot change the sample length for a file that already has data. If you want to change the sample length, you must start a new file. Figure 4-8 shows an example Properties dialog box showing the Scheduling tab. A description of each parameter follows.

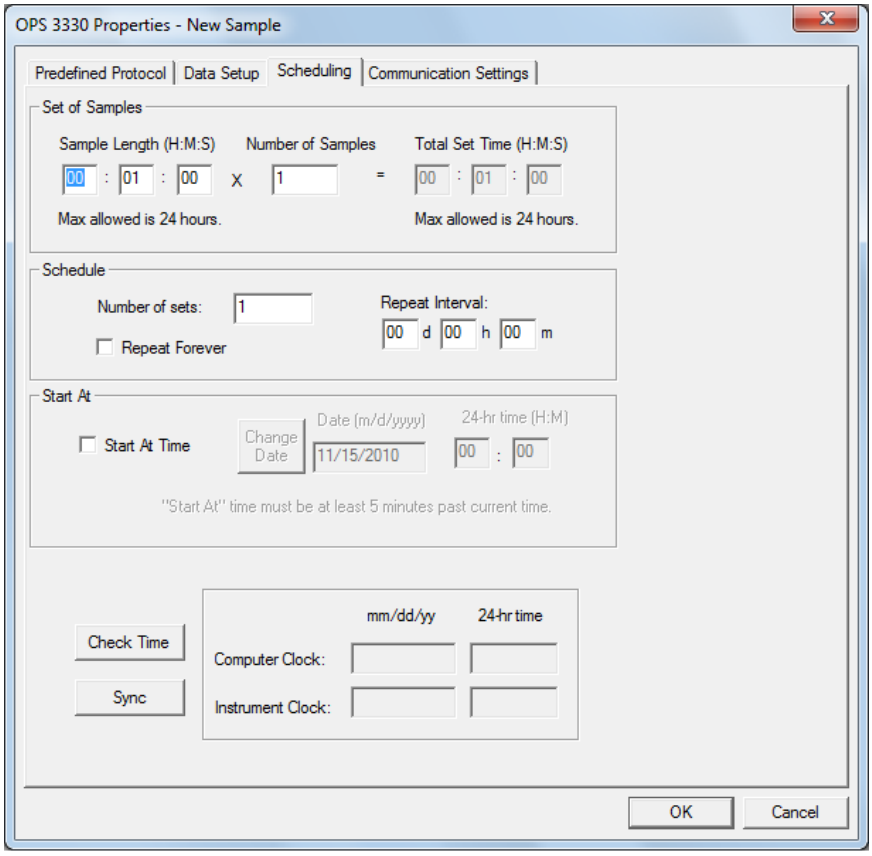



**Figure 4-8**
Scheduling Tab of the Properties Dialog Box for the OPS 3330

**Table 4-3**
Descriptions of Scheduling Parameters for an OPS Spectrometer

| Parameter | Description |
|---|---|
| Sample length (H:M:S) | This is the amount of time (in Hours, Minutes and Seconds) that data will be collected from the spectrometer for each sample. The maximum value allowed is 24 hours. |
| Number of Samples | This is the total number of samples you want to collect. The maximum value allowed is 65535. |
| Time Length for Set | This field is calculated by the software and shows the total sample time based on the values you entered in the Sample Length and Number of Samples boxes. The value is displayed in hours, minutes, and seconds. The maximum value allowed is 24 hours. |
| Schedule | Enter the number of sets you want to collect or check **Repeat Forever** to repeat collection of the sample sets until you manually stop data collection. **Repeat Interval** refers to the interval between the start of one set of samples and the start of the next set. This interval must be greater than or equal to the time required for one set of samples. |
| Start At | If you don't check the Start At Time box, sampling begins as soon as you select **Start Data Collection**.<br>If you want to select a start time, check the box and enter the clock time at which you want sampling to begin. The program uses a 24-hour clock.<br>The reference time for the program is the time at which your computer is set. |
| Check Time | This button displays the current computer date and time and the current instrument date and time. |
| Sync | This button sets the date and time in the instrument to the current computer date and time. |

### Files of Sample Sessions That Run Past Midnight

The files for sample sessions that run past midnight are handled differently than those that start and stop on the same date. In this case a sequence of files is created, with each file in the sequence given a unique filename extension identifying its proper order. Appendix E provides a complete description of sequence files including how to access a file that is part of a sequence.

## Communication Settings Tab

The Communication Settings tab lets you set up and connect the instrument to your computer. Refer to Step A: Open a New OPS File for information on how to connect to the instrument.

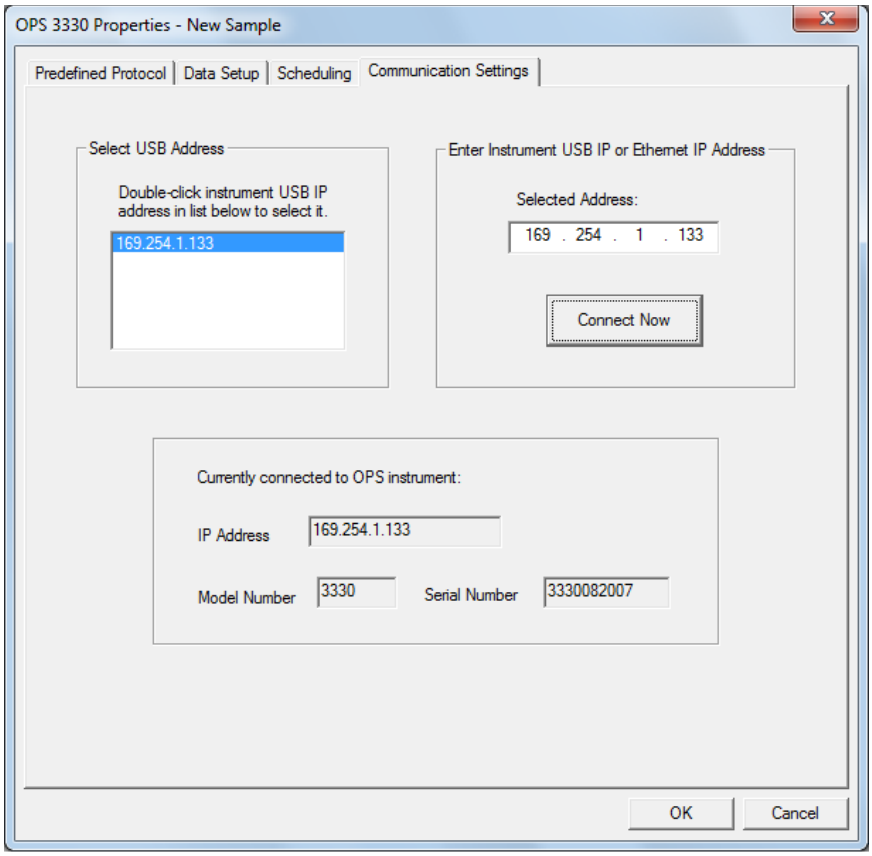



**Figure 4-9**
The Communications Settings Tab of the OPS Properties Dialog Box

**Table 4-4**
Descriptions of Communications Parameters for an OPS Spectrometer

| Property | Description |
|---|---|
| Select USB Address | If the OPS is connected to the computer by a USB cable, the software automatically detects the instrument USB IP address and displays it in this section. You can then double-click the displayed address to automatically enter it in the IP Address box. |
| Enter Instrument USB IP or Ethernet IP Address | If you are connected to the instrument though a network, enter the IP Address of the instrument. |
| Connect Now | After you have an IP Address in the IP Address box, press this button to connect to the instrument. |
| Currently connected to IP Address: | Displays the IP address to which you are currently connected. |

# Append Sample Data to an Existing OPS File

To append sample data to an existing OPS file:

1. Open the file to which you want to append data .
2. Select **Run | Connect to the OPS**.

If a connection is not found, an error message will be issued. You can open the Properties dialog and select the Communications tab to establish a connection with the OPS spectrometer.

Once there is a valid connection, the New Sample icon appears in the Samples List window and the Start Data Collection button  is enabled on the toolbar. You can then append samples to the data file (see Step C: Start Data Collection, above).

# Active Menus for an OPS Spectrometer

This section describes the various functions available for an OPS spectrometer through the menus on the Aerosol Instrument Manager® desktop. The Menus include: File, Run, Playback, Format, View, Sample, Window, and Help.

Which menus are available (visible and active) depends on the operation you are currently performing on the desktop.

In addition to the menus, a toolbar (located just beneath the desktop menus) is available to provide shortcuts to many of the functions in the menus. You can hide the toolbar if you want to enlarge the desktop, see the description of the View Menu, below.

***Note:*** *All menus and the menu items are described below. Depending on the operation you are currently performing and the window that is active on the desktop, the menu may appear different than shown, i.e., some menu items may not be available.*

## File Menu

The items of the File menu are used to open, save, and recall files and perform other program operations.

When you first start the program and no files are open the choices on the File menu are shown in the figure below.

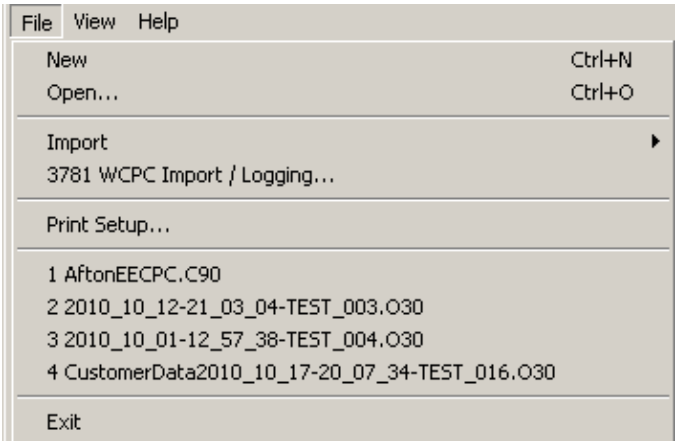



**Figure 4-10**
Initial File Menu for an OPS Spectrometer

After files have been opened or imported the menu is changed to what is shown below.

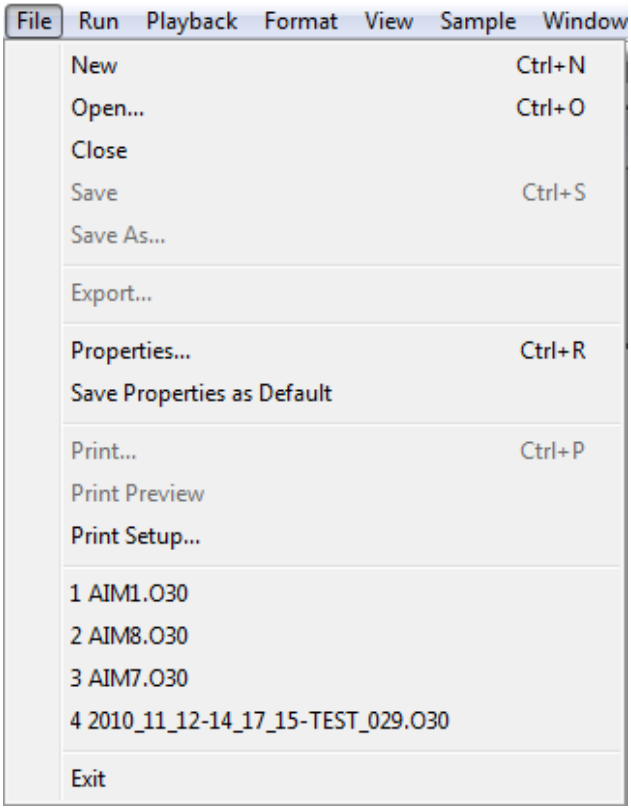



**Figure 4-11**
File Menu for an OPS Spectrometer

## New

Select **File | New** or  on the toolbar to open a new file and prepare to collect sample data.

After you select **New**, you are prompted to enter a filename. Accept the default filename or enter any filename you chose, then select **OK**.

A Samples List window and a graph window open on the desktop with the filename you entered and you are ready to start collecting data. Refer to "How To Collect Sample Data" for a complete description.

## Open

Select **File | Open** or  on the toolbar to open an existing file. By default, sample files are stored in the same directory as the Aerosol Instrument Manager® program. All files will automatically be given the appropriate filename extension according to the spectrometer model you are using (see above description). If you store data files in another directory or on another drive, you must first display the file pathname in the Open window before you can select and open it.

***Note:*** *When opening files for sample sessions that run past midnight, refer to the description of Sequence Files in Appendix E and for information on how the files are opened.*

When the file opens, a window opens on the Aerosol Instrument Manager® desktop containing data from the first sample in the file.

You can have many samples and many files open on the desktop at the same time. Only one window, however, is the active window.

## Import

Select **File | Import | OPS 3330 Log Files ..**.to display the Import OPS Log File dialog. Refer to "Import Logged Data into an Aerosol Instrument Manager® OPS Software File" in Chapter 3 for a complete description.

Once imported these files are the same as files created using Aerosol Instrument Manager® software to collect the data and will have the .O30 extension.

## Close

Select **File | Close**  to close a file (and all the windows associated with it). If windows are open on the desktop from more than one file, **Close** will close only those windows associated with the file whose window is currently active. If you attempt to close a file that has been changed but not saved, you will be prompted to save the changes before closing the file.

If you have marked a sample or samples for deletion, but have not saved the file, you will get the following message: "Some samples have been marked for deletion. Do you want them permanently removed?" If you click **Yes** the sample files marked for deletion are permanently deleted. If you click **No** the samples marked for deletion are not deleted. They are saved, and are no longer marked for deletion.

## Save

Select **File | Save** or  on the toolbar to save sample data to a file.

If you have marked a sample or samples for deletion, but have not saved the file, you will get the following message: "Some samples have been marked for deletion. Do you want them permanently removed?" If you click **Yes** the sample files marked for deletion are permanently deleted. If you click **No** the samples marked for deletion are not deleted. They are saved, and are no longer marked for deletion.

## Save As

Select **File | Save As** to save data in an existing file to a new filename. (The file contents are duplicated to the new filename. If you want to delete the original filename, use Windows® Internet Explorer® to do so.)

After you select **Save As**, you can select a drive/directory. You can use the same filename if you save the file to another drive/directory, but if you want to save the file to the same directory, you must give it a new name.

Do *not* add the filename extension. It is added automatically when you select **Save**.

## Export

Select **File | Export** to export data (either a single sample or multiple samples of a file) for use in another program. Data is exported in a delimited text file. Refer to "Export Data to a File" in Chapter 3 for information.

### Properties...

Select **File | Properties** to set the parameters used by the Aerosol Instrument Manager® software to collect sample data. The Properties dialog box has four tabs. The parameters that can be set for each spectrometer on each tab are described in "How To Collect Sample Data" earlier in this chapter.

### Save Properties As Default

Select **File | Save Properties as Default** if you want the properties for the currently selected sample to be the default properties for new samples.

### Print

Select **File | Print** or  to print the active window on the desktop. If you want to preview the output before printing it, select **File | Print Preview**.

Refer to your Windows® documentation for information about the Print dialog box.

### Print Preview

To avoid printing something you don't want, select **File | Print Preview** to see what your printed output will look like before selecting **Print** (Figure 4-12).

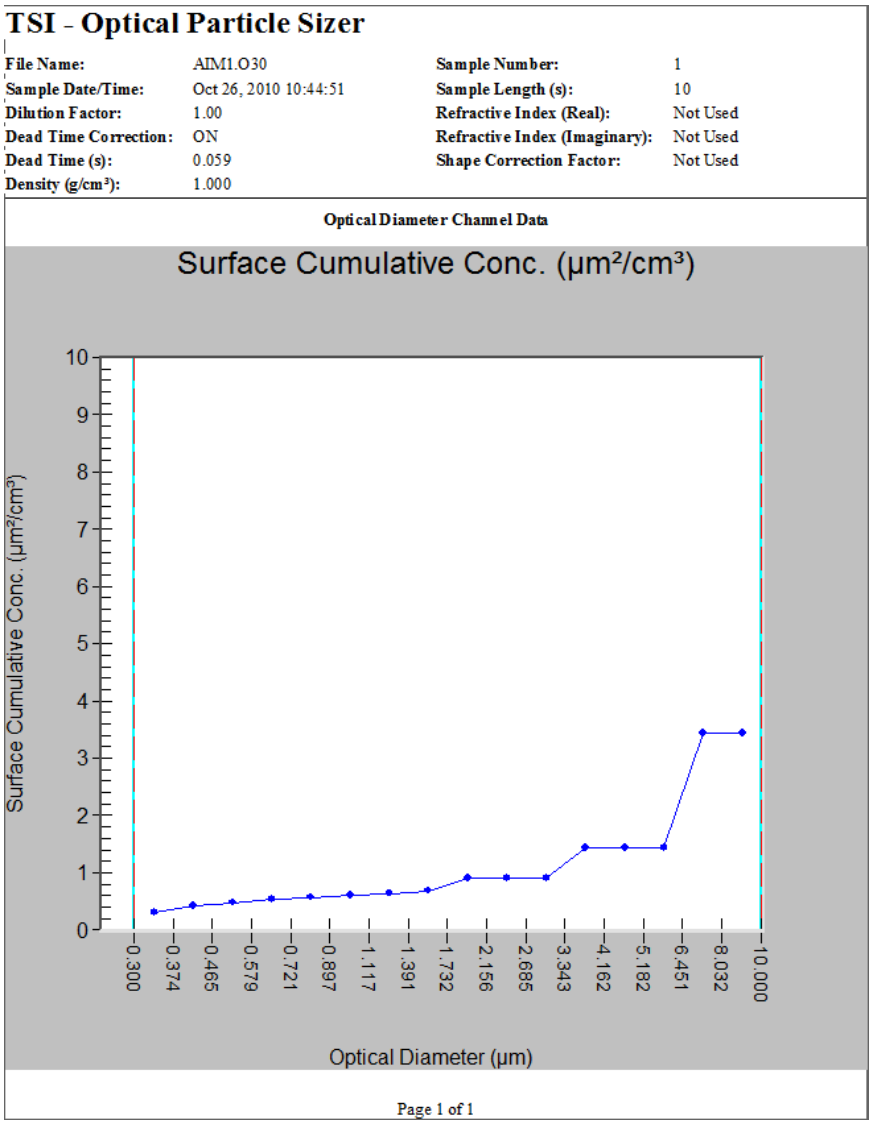



**Figure 4-12**
Print Preview Lets You See What Will Be Printed Before You Print It

## Print Setup

Select **File | Print Setup** to set up the printer for printing. Refer to your Windows documentation and your printer's documentation for information about setting the printer parameters.

## List of Recently Accessed Files

Between the Printer Setup and Exit menu items is a list of the most recently accessed data files (a maximum of four files is displayed). These are accessed from the menu by selecting **File | 1**, **2**, **3**, or **4**.

The list provides a shortcut to these files so you can bypass the Open command. To open one of the files listed, use the mouse to highlight it and then click the left mouse button. The file opens on the desktop.

### Exit

Select **File | Exit** to end the program.

## Run Menu

The items available under the Run menu are used to start and stop data collection.

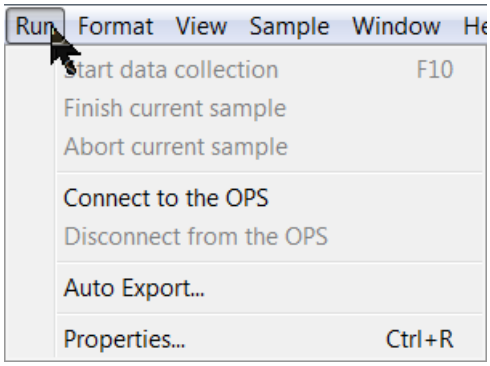



**Figure 4-13**
Run Menu for the OPS Spectrometer

### Start Data Collection

With a new file open on the desktop, select **Run | Start Data Collection** or on the toolbar to begin collecting sample data. Samples are collected according to the sample length, number of samples, scheduled times and other parameters set in the tabs of the Properties dialog (see earlier in this chapter).

***Note:*** *If a start time is set, this menu item (and its associated icon) is disabled.*

Once you select **Start Data Collection**, sampling begins immediately. As data is collected, it is displayed in the open windows.

### Finish Current Sample

Select **Run | Finish Current Sample** when you want to stop collecting sample data prematurely (Before the sampling period ends as set in the Properties dialog.). When you select this item, the current sample is allowed to finish before sampling ends.

### Abort Current Sample

Select **Run | Abort Current Sample** or  from the toolbar when you want to stop collecting sample data immediately. When you select this item, sampling stops and the data collected for the current incomplete sample is discarded.

### Connect to the OPS

Select **Run | Connect to the OPS** if you want to use an open data file to append more samples to the file. If a connection is not found an error message will be issued. You can open the Properties dialog, select the Communications tab to establish a connection with the OPS spectrometer.

Once there is a valid connection, the New Sample icon appears in the Samples List window and the Start Data Collection button  is enabled on the toolbar. You can then append samples to the data file.

### Disconnect from the OPS

Select **Run | Disconnect from the OPS** to disconnect from the instrument and stop collecting samples. You cannot append samples to a file unless it is connected to the OPS spectrometer. Once the OPS is disconnected, the New Sample icon is removed from the Samples List window and the Start Data Collection button  is disabled.

### Auto Export

Select **Run | Auto Export** to automatically export the data as it is collected to a file. When you select this menu item, an Export Dialog box opens. Select the type of data you want to automatically export, then press **OK**.

***Note:*** *You cannot auto-export raw data or export data in columns.*

See "Export Data to a File" in Chapter 3.

### Properties…

This menu item provides a shortcut to the same Properties menu item listed under the File menu and appears here for convenience.

Select **Run | Properties** to display the Properties dialog that lets you set the parameters used by the Aerosol Instrument Manager® software to collect sample data.

The parameters that can be set are described earlier in this chapter.

## Playback Menu

The Playback menu appears only when a Sample List window is active on the desktop. Its purpose is to allow you to display graphic and table windows in series, like a slide show, so that you can compare samples or view a series of samples.

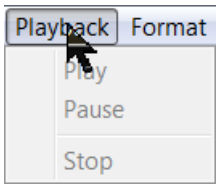



**Figure 4-14**
Playback Menu

Refer to "Playback (Review) Data Samples" in Chapter 3 for instructions.

### Play

Select **Playback | Play** or ▶ from the toolbar to display the control window for playing the samples you selected. First select the time you want each sample displayed (full speed, 0.5, 1.0. 2.5 or 5.0 seconds). Then select whether to view the samples once or continuously. As soon as you select **Play Once** or **Play Continuously** the open views for the first sample you selected are displayed for the specified period, then the views for the second sample are displayed, and so on until all the samples selected have been displayed. If you selected **Play Continuous** from the Playback Setup dialog box, the series repeats itself indefinitely.

### Pause

Select **Playback | Pause** or ⏸ from the toolbar to interrupt the playback of the samples. This feature lets you stop playback to view the data of an interesting sample without canceling the playback of all selected samples. When you want to start playback again, select **Playback | Play**.

### Stop

Select **Playback | Stop** or ■ from the toolbar to end sample playback before all samples have been displayed. If you select Stop and you want to restart playback, you must select **Playback | Play**, select the time you want each sample displayed, select play once or continuously, and begin displaying samples from the first selected sample.

## Format Menu

The Format menu has many variations depending on the active window. The menu items of the Format menu let you control how information is presented in tables and graphs including: graph type, grid lines, font, color, etc. When a Sample List window is active on the desktop, the menu items of the Format menu let you determine how items in the Sample List window are displayed. You can select large or small icons, or list the samples with or without details. Details include: date, pathname, and title of the sample.

When a window is active on the desktop, you can display the Format menu items (plus other menu items) by placing the cursor in the window and clicking the right mouse button.

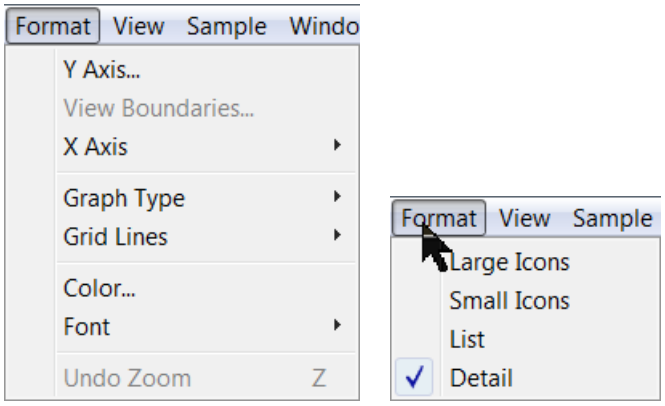



**Figure 4-15**
Format Menu for an OPS File (A) When a Graph Window is Active, (B) When a Samples List Window is Active

### Y Axis

This menu item is available only when a graph window is active on the desktop.

Select **Format | Y Axis** to select the way the Y axis is displayed, see Figure 4-16. By default, the graphs display in normal/auto scale. You can select Auto or Fixed scale and either log or normal scale. To display in logarithmic scale, check the **Log Scale** box.

If you select **Fixed Scale**, you must enter a minimum and/or maximum number (you do not need to enter both).

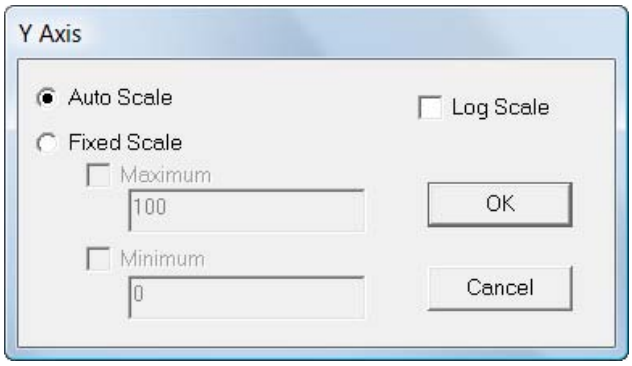



**Figure 4-16**
The Y-Axis Dialog Box

## X Axis

This menu item is available only when a graph window is active on the desktop.

Select **Format | X Axis** to select the way the X axis is displayed. To display in logarithmic scale, check **Log Scale**.

## Graph Type

Select **Format | Graph Type** to select the type of graph to display in the active window. The options are line and points or area. If the Graph toolbar is visible, you can select the option using the appropriate icon.

 Display graphs using lines and points.

 Display graphs showing area.

## Grid Lines

Select **Format | Grid Lines** to select the lines for the graph in the active window. The options are horizontal, vertical, both or none. If the Graph toolbar is visible, you can select the option using the appropriate icon.

 Display graphs with no grid.

 Display graphs with a horizontal grid.

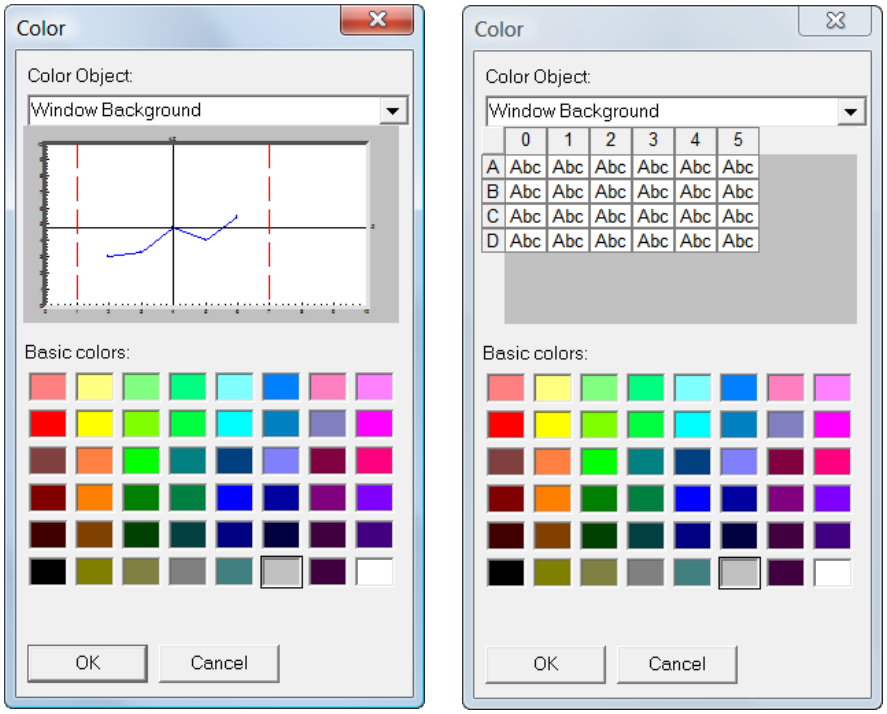
 Display graphs with a vertical grid.

 Display graphs with both horizontal and vertical grids.

## Color

Select **Format | Color** to change the colors used to display items in the active window.

When you select **Format | Color**, the Graph Color or Table Color window opens depending on the active window on the desktop (Figure 4-17 shows both). These windows include a preview screen, a drop down list and a color palette. From the drop down list, select the name of the item you want to modify. The current color for that item is indicated in the color palette. Use the mouse to point to the new color for that item and click the left mouse button to select it. The preview screen then displays the item in the new color.




**(A)** **(B)**

**Figure 4-17**
(A) The Graph Color Dialog Box, (B) The Table Color Dialog Box

Select items from the drop down list and colors as desired. When finished, press **OK**; the colors you selected will be used from that point on in all graphs and/or tables.

The items you can select for windows containing graphs are:

- Window Background
- Plot Area Background
- Labels
- Axis
- Data
- View Boundaries
- Data Hotspot Lines

The items you can select for windows containing tables are:

- Window Background
- Cell Text
- Grid Color
- Cell Background
- Fixed Area Text

## Font

Select the **Format | Font** menu to change the style and size of the text in all graphs or tables.

Select **Format | Font | Style...** to select a new font or change the font style, see Figure 4-18. You can select any font and font style available on your computer. The preview box lets you see what the text will look like before you implement it by selecting **OK**.

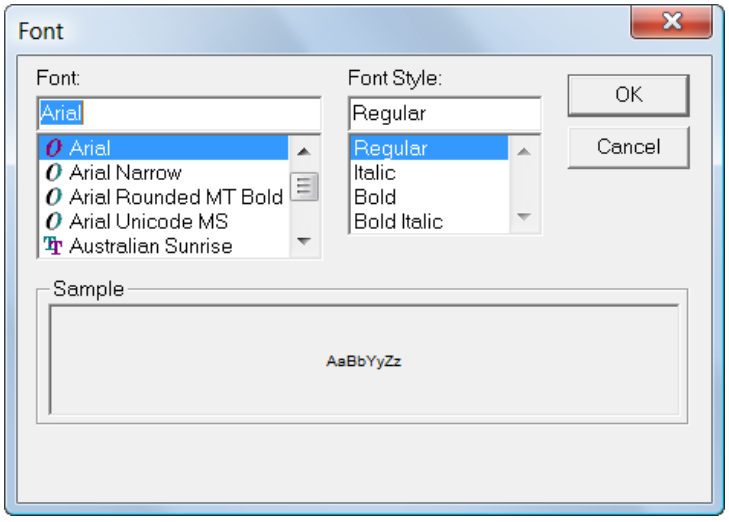



**Figure 4-18**
The Font Dialog Box

To change the font size, select **Format | Font | Small**, **Medium**, or **Large** (the default is Medium). To change the text size without using the menus, select the icon from the toolbar. Each time you select the icon the text size changes to the next text size. (Rotation is from small to medium to large.)

### Undo Zoom

Select **Format | Undo Zoom** to return a graph to its "normal" viewing size after you have zoomed in on a portion of the graph. See "Zoom In and Out on Data in a Graph" in Chapter 3.

## View Menu

The list of items in the View menu depends on which windows are open on the desktop and which one is active. The View menu lets you select the sample windows to open on the desktop and select parameters to view in those windows. A checkmark next to an item indicates the item has already been selected. Look under the Windows® menu to find the item and make it the active window.

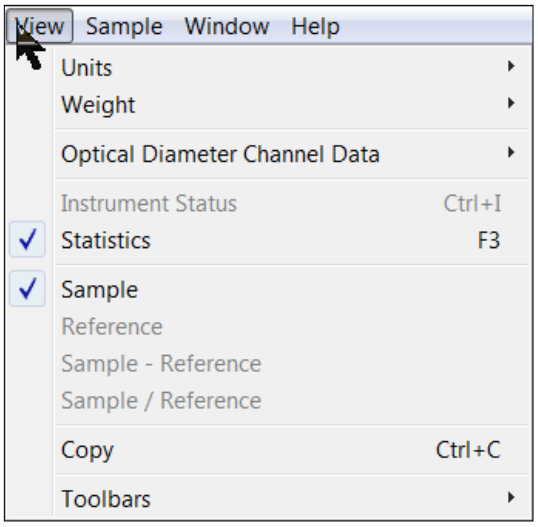



**Figure 4-19**
View Menu for an OPS Spectrometer

### Units

The Units menu item appears when a graph or data table window is active on the desktop. This menu item works in conjunction with the Weight menu item, and lets you choose the units in which data will be displayed.

Unit selections include:

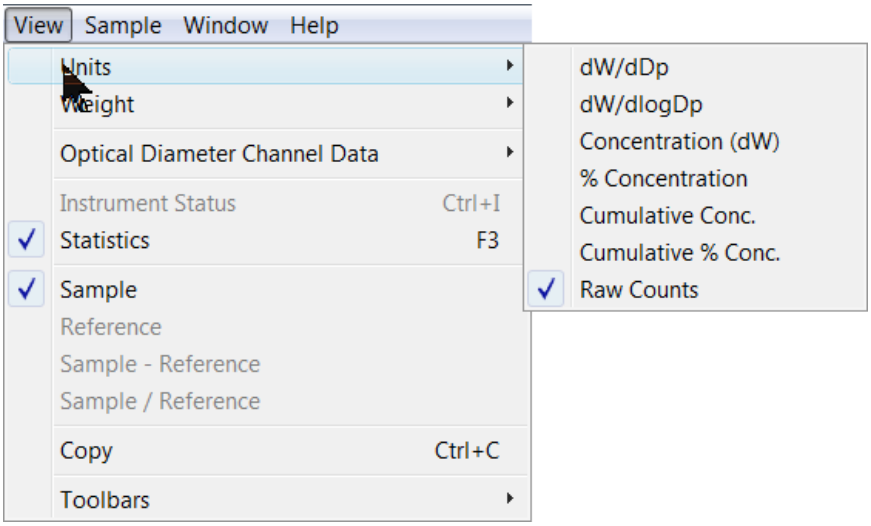



**Figure 4-20**
Units Selection Menu

The currently selected unit is marked with a check mark. This was set by selecting **View | Units | Raw Counts**.

Table 4-5 gives an explanation of each unit.

**Table 4-5**
Display Options for Units

| View Units | Description |
|---|---|
| dW/dDp | This option displays differential particle size distribution normalized to the channel width in µm. This normalized concentration format allows particle size distributions to be compared regardless of the channel resolution. $dW/dDp = dW / (D_{upper\ bound} - D_{lower\ bound})$. W represents the weighting of the distribution, which can be N (number), S (surface area), or M (mass). |
| dW/dlogDp | This option displays differential particle size distribution normalized to the logarithmic channel width. This normalized concentration format allows particle size distributions to be compared regardless of the channel resolution. $dW/dlogDp = dW / (\log(D_{upper\ bound}) - \log(D_{lower\ bound})) = dW / \log(D_{upper\ bound}/D_{lower\ bound})$. W represents the weighting of the distribution, which can be N (number), S (surface area), or M (mass)... |
| Concentration (dW) | This option displays interval particle size distributions. The concentration in any channel represents the concentration within the particle size boundaries for that channel. W represents the weighting of the distribution, which can be N (number), S (surface area), or M (mass). |
| % Concentration | This option displays each particle size channel as a percentage of the total particle concentration. |

| View Units | Description |
|---|---|
| dW/dDp | This option displays differential particle size distribution normalized to the channel width in µm. This normalized concentration format allows particle size distributions to be compared regardless of the channel resolution. $dW/dDp = dW / (D_{upper\ bound} - D_{lower\ bound})$. W represents the weighting of the distribution, which can be N (number), S (surface area), or M (mass). |
| Cumulative Conc. | This option displays the particle concentration in a cumulative or summed format. Each particle size channel represents the total concentration of particles measured below its upper size boundary. |
| Cumulative % Conc. | This option is the same as Cumulative Conc., but displayed as a percentage of the total concentration. |
| Raw Counts | Raw Counts are the lowest level of data representation, raw detected particle counts put into channels by size, but without any corrections. Mapping of particle size within the program can cause single counts to be split across two channels. |

Figure 4-21 shows the Optical Diameter Graph displaying number % concentration using data from a 3330 OPS spectrometer.

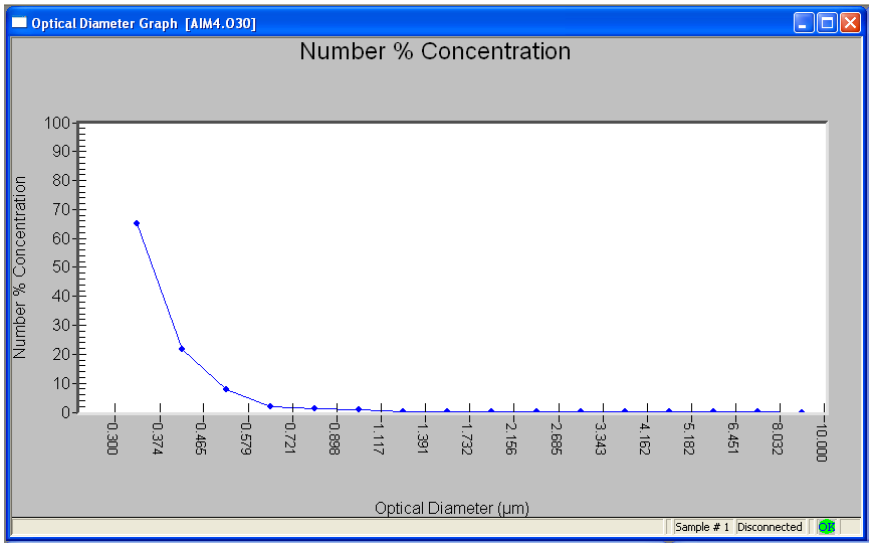



**Figure 4-21**
Optical Diameter Data Displayed in Number % Concentration

## Weight

The Weight menu item appears only when a graph window is active on the desktop. This menu item works in conjunction with the Units menu item and lets you choose how to “weight” the units that are displayed.

You can select:

- Number
- Surface
- Mass

The currently selected weight is marked with a check mark. Table 4-6 gives an explanation of each unit.

**Table 4-6**
Weight Options

| View Units | Description |
|---|---|
| Number | Number represents the total number of particles sampled (i.e., number concentration expressed as #/cm$^3$). Number concentration is the primary measurement of the OPS system.. The distributions of surface area or mass concentrations of the particles are calculated based on the particle number distribution.<br>The number concentration, dN, measured by the OPS spectrometer is the concentration of particles in a given channel. The normalized number concentration, dN/dlogDp, is calculated by dividing dN by the logarithmic channel width. |
| Surface | Surface represents the total number of particles sampled (i.e., surface area concentration expressed as nm$^2$/cm$^3$). The surface area concentration calculation assumes that all the particles are perfect spheres.<br>Surface area concentration is calculated by:<br>$dS=dN \cdot \pi D_{p,s}^2$,<br>where $D_{p,s}$ is the surface area weighted midpoint of the particle size channel. Note that the OPS spectrometer measures the optical diameter of particles. The definition of $D_{p,s}$ is given in Appendix C. The normalized surface concentration based on surface area weighted diameter is:<br>$dS/d\log D_p=dN/d\log D_p \cdot \pi D_{p,s}^2$.. |
| Mass | Mass represents the total mass of the particles sampled (i.e., mass concentration expressed as µg/cm$^3$). The mass concentration calculation assumes that all the particles are perfect spheres with the density defined in the **Run\|Properties** dialog for the instrument.<br>Mass concentration is calculated by:<br>$dM=dN \cdot (\pi/6)D_{p,v}^3\rho$,<br>where $D_{p,v}$ is the volume weighted midpoint of the particle size channel and $\rho$ is the density. Note that the OPS spectrometer measures the optical diameter of particles. The definition of $D_{p,v}$ is given in Appendix C.<br>The normalized mass concentration based on volume weighted diameter is:<br>$dM/d\log Dp=dN/d\log Dp \cdot (\pi/6)D_{p,v}^3\rho$.. |

In many of the tables, the values for all three weightings are supplied in tabular format.

***Note:*** *Surface and Mass weighting calculations assume that all the particles are spherical. Mass calculations also assume that all particles have the density defined in the properties dialog for the instrument. However, comparisons to methods that measure particle surface or mass directly may give results different from those calculated by the software.*

Figure 4-22 shows optical diameter data in units of cumulative concentration weighted by mass.

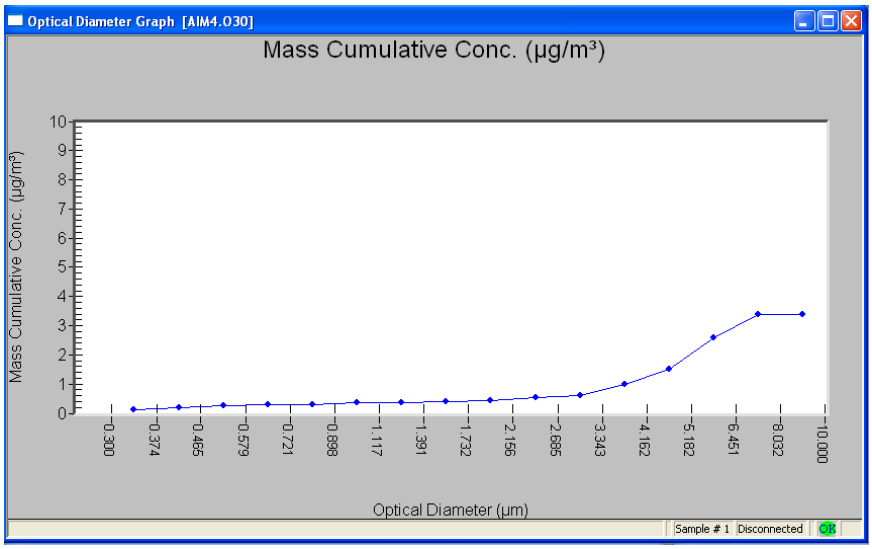



**Figure 4-22**
Optical Diameter Data in Units of Cumulative Concentration by Mass

## Optical Diameter Channel Data

Select **View | Optical Diameter Channel Data | Graph** or **View | Optical Diameter Channel Data | Table** to open a window displaying the optical diameter data of the active sample. (By default, the active sample is the first sample in the file.)

## Instrument Status

Select **View | Instrument Status** to open a window that displays the status of the instrument. The instrument status is only available when connected to the instrument.

***Note:*** *The Humidity (%) is currently only a placeholder for future upgrades. Hence, humidity will be displayed as 0.0 all the time and does not represent the actual humidity of the sampling air.*

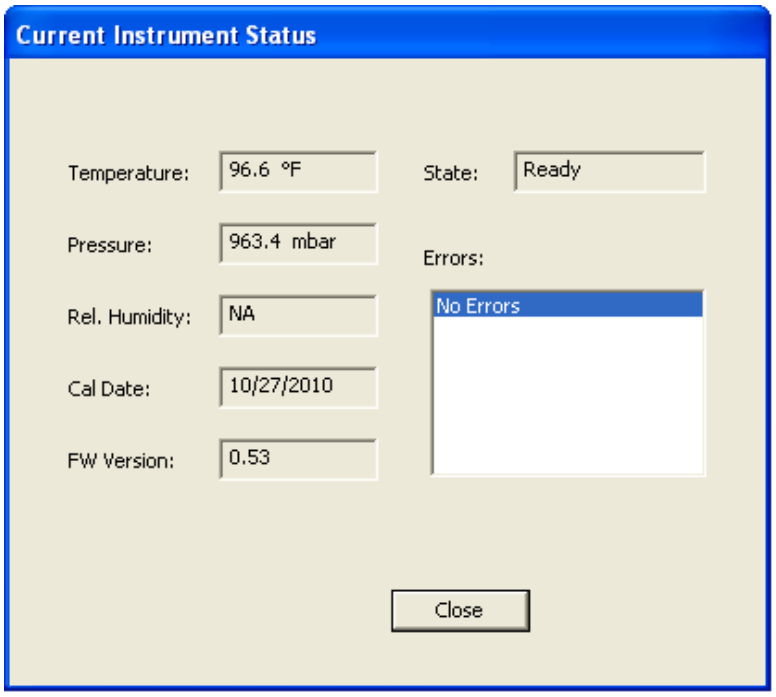



**Figure 4-23**
Instrument Status

Table 4-7 gives an explanation of each field.

**Table 4-7**
Instrument Status Fields

| Status Field | Description |
|---|---|
| Temperature | Calculated inlet temperature in selected units. |
| Pressure | Calculated inlet pressure in selected units. |
| Rel. Humidity | Relative humidity |
| Cal Date | Date the instrument was last calibrated. |
| FW Version | Version of the instrument firmware. |
| State | Current state of the instrument. |
| Errors | Errors, if any, reported by the instrument. |

## Statistics

Select **View | Statistics** to open a window of statistical information for the active sample, see Figure 4-24. The equations used for calculating the values are described in Appendix C.

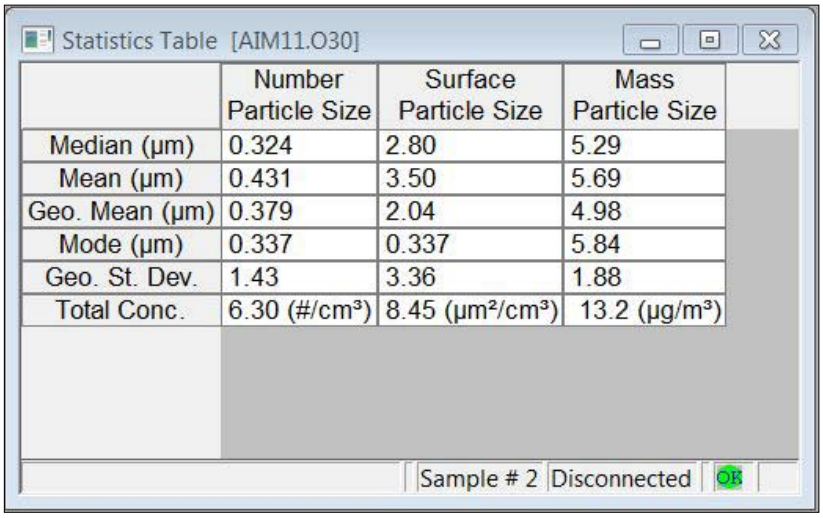



**Figure 4-24**
Statistics Table

## Sample

Select **View | Sample** to view the current sample selected in the Samples List window.

## Reference

Select **View | Reference** to view the reference buffer selected with **Sample | Select as Reference**.

## Sample–Reference

Select **View | Sample-Reference** to view the current sample minus (–) the reference sample. This menu item is not available if no sample has been selected as a reference using **Sample | Select as Reference**.

## Sample/Reference

Select **View | Sample/Reference** to view the current sample divided by (/) the reference sample. This menu item is not available if no sample has been selected as a reference using **Sample | Select as Reference**.

***Note:*** *Statistics are not calculated for this option. All fields in the table will be blank.*

## Copy

Select **View | Copy** or  from the toolbar to copy the active window to the clipboard so that you can "paste" it in other applications, for example a word processing program.

## Toolbars

Select **View | Toolbars** to display or hide the toolbars that appear on the desktop. Each toolbar is illustrated below:

 Main Toolbar

 Color and Font Toolbar

 Graph Toolbar

 Navigation Toolbar

By default, only the Main and Navigation toolbars are displayed.

To view what each icon (tool) does, position the cursor on the icon. A balloon will appear to describe the function of the icon.

Toolbars can be moved and resized if desired. To move a toolbar, position the cursor on a gap between two tools and press and hold the left mouse button. As you move the mouse, the toolbar moves with it. To resize a toolbar, position the cursor at an edge or corner of the toolbar window that you have moved and resize it as desired. You can hide a toolbar by selecting the "x" in the upper right corner.

## Sample Menu

The Sample menu lets you navigate through files with multiple samples.

***Note:*** *You can also navigate through files with multiple samples using the Navigation toolbar.*

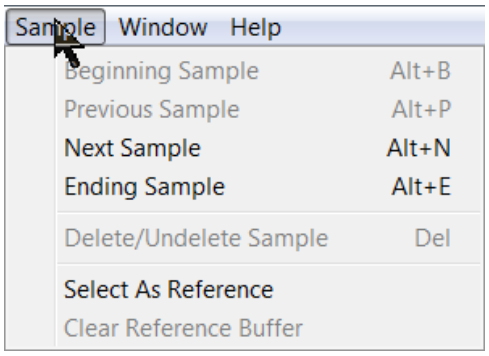



**Figure 4-25**
Sample Menu

### Beginning Sample

Select **Sample | Beginning Sample** or  from the toolbar to display the data for the first sample of the file in the active window.

### Previous Sample

Select **Sample | Previous Sample** or  from the toolbar to display the data for the previous sample of the file in the active window.

### Next Sample

Select **Sample | Next Sample** or  from the toolbar to display the data for the next sample of the file in the active window.

### Ending Sample

Select **Sample | Ending Sample** or  from the toolbar to display the data for the last sample of the file in the active window.

### Delete/Undelete Sample

Select **Sample | Delete/Undelete Sample** to select (highlight) a sample in the Samples List window for deletion (or to unselect a sample marked for deletion). Samples marked for deletion are not actually deleted from file until you perform a **File | Save** or **File | Close**.

### Select As Reference

Select **Sample | Select As Reference** to select the current sample as a reference sample. This sample can then be subtracted from the current sample or you can divide the current sample by the reference sample. Refer to the View menu items above.

### Clear Reference Buffer

Select **Sample | Clear Reference Buffer** to clear the reference buffer.

## Window Menu

The Window menu items let you open, close and arrange the windows on your desktop. Refer to your Microsoft Windows® documentation for an example of what each command does.

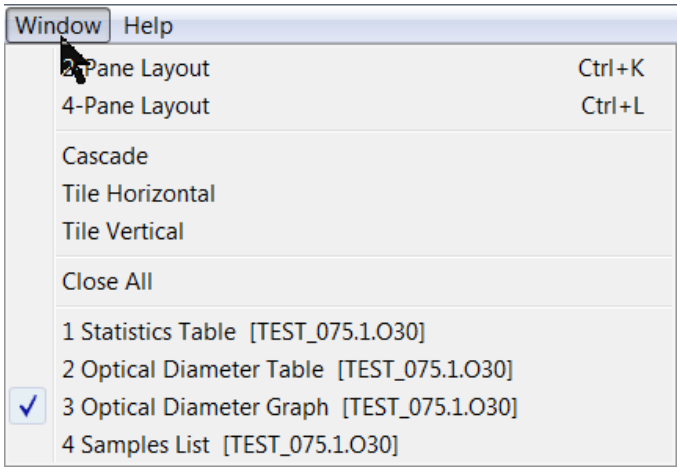



**Figure 4-26**
Window Menu

All windows on the desktop, whether active or inactive, are listed after the Close All command; the active window is shown with a check mark. To make a different window active and bring it to the front, select it with the mouse.

## Help Menu

The Help menu provides access to information about the program.

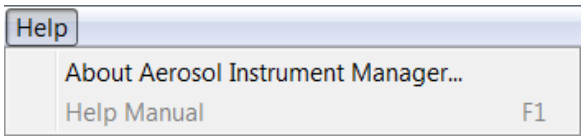



**Figure 4-27**
Help Menu

## About Aerosol Instrument Manager® Software

Select **About Aerosol Instrument Manager** to see the copyright statement for the program and view the version number of the software.

## Help Manual

Select **Help|Help Manual** to see this manual: Aerosol Instrument Manager® Software for OPS Spectrometer.

APPENDIX A

# Data Files, Project Files, and Stored Parameters

The Aerosol Instrument Manager® Software stores data in two types of files: data files and project files. This appendix describes those files and the parameters stored in them. In addition, it also describes the parameters stored in the aim.ini file.

## Data Files and Project Files

The Aerosol Instrument Manager® Software uses two types of files:

- Data files
- Project files

**Data files** contain sample data. They have a filename extension to indicate the type of spectrometer from which data was collected, such as .O30 for an OPS 3330. Other information stored in data files includes:

**Information stored for the whole file:**

Instrument Model and Serial Numbers
Sample time length
Number of Channels
Channel Boundaries
Whether or not raw data is included with samples
Dead Time Correction Value
Refractive Index (if used)
Alarm Settings

**Information stored for each OPS sample:**
Relative humidity
Density (one density or a density for each channel)
Dead time for this sample[1]
Error flags
Calculated inlet pressure
Calculated inlet temperature
Dilution factor
Whether or not an alarm was triggered during sample collection

***Note:*** *The Humidity (%) is currently only a placeholder for future upgrades. Hence, humidity will be displayed as 0.0 all the time and does not represent the actual humidity of the sampling air.*

**Project files** are created by the program when you open a data file and work with it. Each project file has a name that corresponds to the data file that was open when the project file was created. The OPS 3330 data file extension is .O30 and the project file extension is .p30. Project files keep track of "cosmetic" attributes like which windows are open on the desktop when you close the file and how that information is displayed.

If you transfer data files to someone, you do not need to transfer the project files unless you want to. If you delete a project file, a new project file is created when you reopen the data file.

# Project File Parameters

The following parameters are saved for each window (i.e., the selection of Units for the Optical Diameter table will be stored for the Optical Diameter table only, the selection of Units for the graph will be stored only for the graph):

- The graph type (lines and points or area)
- The grid type (none, vertical, horizontal or both vertical and horizontal)
- Y axis scale parameters
- Units and weights selected
- List type, for the Samples List window
- Position and size of the window

[1] The dead time for each sample is stored with the sample. Each sample can have a different dead time. Whether or not to apply dead time correction is something that is applied (or not applied) to all samples in the file.

The following parameters apply to the entire file (not to each individual window):

- View range
- Playback delay time
- Current sample index (the sample number of the sample you were viewing when you exited the program)
- Reference sample.

## Stored Parameters

The following parameters are stored for the Aerosol Instrument Manager® application and are applied to all documents:

- Font and color for tables.
- Font and color for graphs.
- Aerosol Instrument Manager® window size and position.

The following parameters are stored for the same instrument type:

- Window positions the last time a file was closed.
- Parameters from each different instrument Properties dialog box.

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APPENDIX B

# Accelerator Keys and Right-Click Menus

Accelerator keys are those keys and key combinations that allow you to perform operations using only your keyboard (no mouse required).

These are the accelerator keys that can be used with an OPS spectrometer.

| Key(s) | Action for OPS |
|---|---|
| F1 | Help |
| F3 | View statistics |
| F4 | View sample list |
| F5 | View Optical Diameter graph |
| Shift F5 | View Optical Diameter table |
| F10 | Start Sampling |
| Shift F10 | Finish recording current sample |
| Alt B | Go to first sample “Begin” |
| Ctrl A | Select all samples |
| Ctrl C | Copy current view to clipboard |
| Alt E | Go to last sample “End” |
| Ctrl K | 2-Pane Window Layout |
| Ctrl L | 4-Pane Window Layout |
| Alt N | Next sample |
| Ctrl N | New document |
| Ctrl O | Open a document |
| Alt P | Previous sample |
| Ctrl P | Print current view |
| Ctrl R | View Sample Properties |
| Ctrl S | Save |
| Z | Undo Zoom |

The data windows (graph, table, sample, statistics) that are displayed when a file is open have many menu selections available to change how the data is displayed. To make it easier to change these settings each window has an associated “right-click” menu that can be accessed by pressing your right mouse button when your cursor is over that window. Examples of these menus are shown in the figures below.

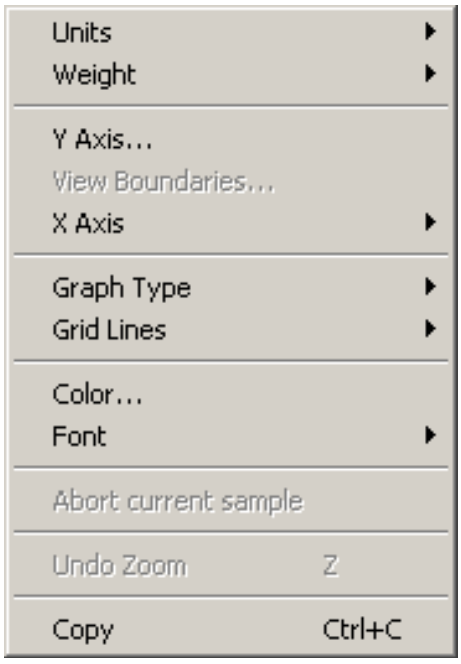


**Figure B-1**
Graph Menu

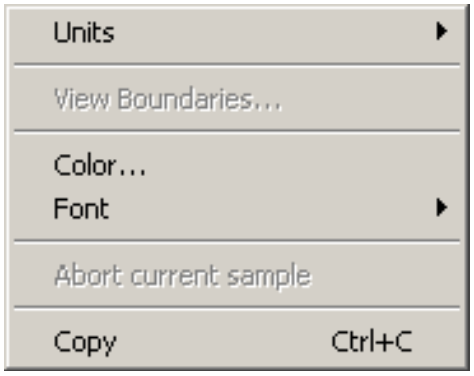


**Figure B-2**
Table Menu

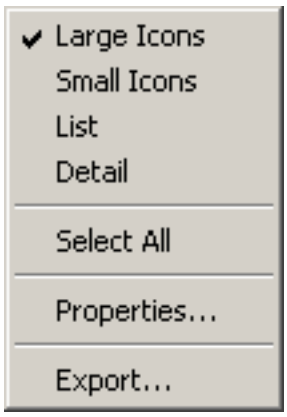


**Figure B-3**
Samples Menu

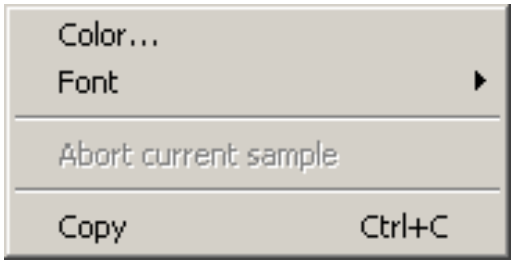


**Figure B-4**
Statistics Menu

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APPENDIX C

# Calculations Used for OPS Spectrometers

This appendix gives an explanation of the statistics calculations used by the Aerosol Instrument Manager® Software. The statistics are calculated for the interval defined by the upper and lower bounds selected from the graphs, which are not necessarily the entire size range of the instruments. Note that channel mid points used in the OPS calculation are defined based on arithmetic mean. In addition, surface area calculation is based on surface area weighted diameter ($D_{ps}$) while volume and mass calculations are based volume weighted diameter ($D_{pv}$).

| Statistic/Weight | Number | Surface Area | Volume | Mass |
|---|---|---|---|---|
| Concentration | $n = \frac{c}{tQ}\phi$ | $s = \pi D_{ps}^2 n$ | $v = \frac{\pi D_{pv}^3 n}{6}$ | $m = \rho v$ |
| Total Concentration | $N = \sum_{l}^{u} n$ | $S = \sum_{l}^{u} s$ | $V = \sum_{l}^{u} v$ | $M = \sum_{l}^{u} m$ |
| Mode | $D_p\left(\left(\frac{n}{dD_p}\right)_{\max}\right)$ | $D_p\left(\left(\frac{s}{dD_p}\right)_{\max}\right)$ | $D_p\left(\left(\frac{v}{dD_p}\right)_{\max}\right)$ | $D_p\left(\left(\frac{m}{dD_p}\right)_{\max}\right)$ |
| Median ($\tilde{x}$) | $D_p(N/2)$ | $D_p(S/2)$ | $D_p(V/2)$ | $D_p(M/2)$ |
| Mean ($\bar{x}$) | $\frac{\sum_{l}^{u} nD_p}{N}$ | $\frac{\sum_{l}^{u} sD_{ps}}{S}$ | $\frac{\sum_{l}^{u} vD_{pv}}{V}$ | $\frac{\sum_{l}^{u} mD_{pv}}{M}$ |
| Geometric Mean ($\bar{x}_g$) | $\exp\left[\frac{\sum_{l}^{u} n\ln(D_p)}{N}\right]$ | $\exp\left[\frac{\sum_{l}^{u} s\ln(D_{ps})}{S}\right]$ | $\exp\left[\frac{\sum_{l}^{u} v\ln(D_{pv})}{V}\right]$ | $\exp\left[\frac{\sum_{l}^{u} m\ln(D_{pv})}{M}\right]$ |

| | | |
|---|---|---|
| Geometric Standard Deviation ($\sigma_g$) | $\exp\left[\frac{\sum_{l}^{u} n\left[\ln D_p - \ln \bar{x}_g\right]^2}{N}\right]^{1/2}$ | substitute $D_p$, $s$, $v$, $m$ and $S$, $V$, $M$ in place of $n$ and $N$ for other weightings |

$$D_p = \frac{1}{2}(LB + UB)$$

$$D_{ps} = LB\left[\frac{1}{3}\left(1 + \left(\frac{UB}{LB}\right) + \left(\frac{UB}{LB}\right)^2\right)\right]^{\frac{1}{2}}$$

$$D_{pv} = LB\left[\frac{1}{4}\left(1 + \left(\frac{UB}{LB}\right)^2\right)\left(1 + \left(\frac{UB}{LB}\right)\right)\right]^{\frac{1}{3}}$$

The symbols used in the formulas are defined as:

*UB* = channel upper boundary
*LB* = channel lower boundary
*c* = particle counts per channel
*n* = number weighted concentration per channel
*s* = surface area weighted concentration per channel
*v* = volume weighted concentration per channel
*m* = mass weighted concentration per channel
$\eta$ = sample efficiency factor per channel
$D_p$ = particle diameter (channel midpoint)
*C* = total particle counts
*N* = total number concentration
*S* = total surface area concentration
*V* = total volume concentration
*M* = total mass concentration

$Q$ = sample flow rate
*t* = sample time
$\rho$ = particle density
$\phi$ = dilution factor
*ln* = natural log
*exp* = base of natural log (*e*)
*l* = lower channel boundary
*u* = upper channel boundary

## Refractive Index Correction

Since almost all optical particle spectrometers and counters are factory-calibrated with polystyrene latex (PSL) particles, size errors could be significant if the refractive indices of aerosols are very different from the PSL refractive index 1.59. To address this issue, the OPS features on-board Mie scattering calculation capability to

adjust the PSL calibration curve to a curve that better fits the aerosols of interest. To make the adjustment, you need to enter the value of the refractive index of the aerosols of interest. The on-board program will then estimate the scattering intensity based on Mie scattering theory, and adjust the factory PSL-calibrated curve accordingly. For non-spherical particles, an additional shape factor is available to perform further adjustments on the calibration curve.

One way to do the adjustment is to compare the OPS measured sizes with the known sizes (such as differential mobility analyzer classified monodisperse particles) from the aerosols of interest, and then tweak the shape correction factor to make OPS measured sizes as close as possible to the known aerosol sizes. Note that the new refractive index corrected calibration curve is saved separately and the factory PSL-calibrated curve is not replaced.

The table below indicates the default and allowable values of the refractive index and shape correction factor.

| | **Default** | **Allowable Value** |
|---|---|---|
| Refractive Index – Real | 1.59 | 1.2 to 6 |
| Refractive Index – Imaginary | 0 | 0 to 6 |
| Shape Correction Factor | 1 | 0.1 to 3 |

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APPENDIX D

# Concentration Calculation

The Optical Particle Sizer (OPS) spectrometer measures particle concentration by counting individual pulses from the photodetector. This works well when particle concentrations are low, but when particle concentrations are high, pulses start to overlap each other. Because of this, particle concentrations based solely on the number of pulses underestimates the number of particles entering the viewing volume.

When a particle is detected entering the optical viewing volume, no other particles can be counted. As the particle concentrations increase, the amount of time blocked by the presence of particles becomes significant. If the particle concentration is computed using elapsed time, the value will be under reported.

The actual sample time needs to be corrected for this blocked or dead-time. To adjust for this effect, the Optial Particle Sizer measures the dead-time resulting from the presence of particles in the viewing volume and subtracts it from the sample time. This sample live-time value is used in place of the sample time for the concentration calculations, as shown in the equation below. At very high concentrations, the dead-time value grows and the adjustment becomes large. Single particle events may not even be detected since particles are nearly continually in the measurement viewing volume and the accuracy of the live-time measurement begins to diminish.

The High Concentration warning will flag when the concentration error exceeds 10%. The threshold of this warning depends whether the dead time correction is turned on and off. The threshold is set at 1000 #/cm$^3$ (total concentration) when dead time correction is disabled. With dead time correction enable, the threshold is set at 3000 #/cm$^3$ (total concentration). By default, the dead time correction is enabled and can be turned off at the instrument or in the Aerosol Instrument Manager® software program.

$$C_i = \frac{N_i}{Q \times (t_s - DTC \times t_d)}$$

where,

$C_i$ = concentration at size channel i
$N_i$ = number count in #/cm$^3$ at size channel i
$Q$ = sample flow rate, 16.67 cm$^3$/s
$t_s$ = sample time in second
$t_d$ = dead time in second
$DTC$ = dead time correction factor and set to 1.0

When measuring polydisperse aerosol, the dead time correction may have additional error because the particle pulse widths increase with particle sizes so the amount of dead time measured by the counter is the “average” dead time caused by various pulses. This average dead time is then applied to all size channels. It is estimated that the concentration error caused by the non-uniform pulse widths is no more than 15% of total concentration.

APPENDIX E

# Sequence Files

The files for sample sessions that run past midnight (or run for more than 24 hours) are handled differently than those that start and stop on the same date. (Midnight occurs on your system according to the setting of your computer's system clock.)

For these sample sessions, a **sequence of files** is created, with each file in the sequence given a unique filename extension identifying its proper order.

Normally, only a single file is created for any sample session and it has a filename extension of the form .O30. For example, Atmosphere.O30, which would identify the file as an Optical Particle Sizer (OPS) spectrometer file.

If the sample session period runs past midnight, a file is created for each date (day). The samples collected before midnight (including the sample that is running at midnight) are collected in a file with the normal extension, i.e., .O30

Samples that are collected after midnight are saved in a file with an extension of the form ".1.O30" . (Using the same example as above, the next filename would be "Atmosphere.1.O30.")

For a very long sample session, a file is created each time the sample session runs past midnight and is indicated by adding a new number to the file extension. Using the previous example, the file following "Atmosphere.1.O30" is "Atmosphere.2.O30" and the next file would be "Atmosphere.3.O30" and so on.

These files contain information to link them when opened and the files can be recalled as if they were a single file. The files may also be selected and opened as individual files.

When you save the samples collected during a sample session that runs past midnight, you provide a filename just as you would for any sample session. You do *not* provide any extensions. The software automatically adds a file extension.

# Opening a File That is Part of a Sequence

If you select **File | Open** and the file is part of a sequence of files (i.e., the sample session ran over midnight), the following dialog box appears:

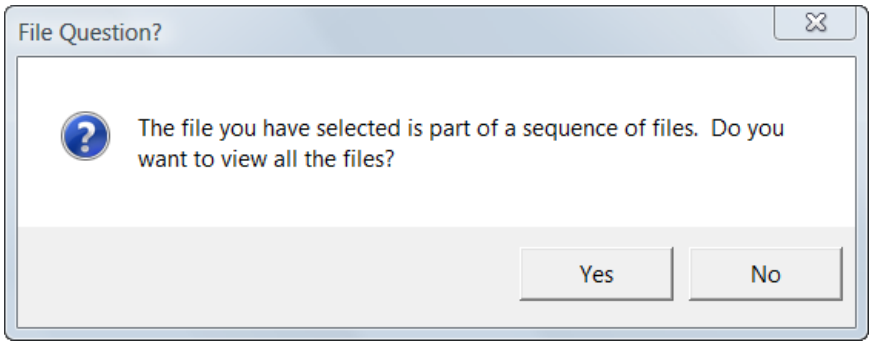


**Figure E-1**
File Question? Dialog Box

You have the option of opening all the files or only a single one.

If you select **No**, only the file you have selected will open and only the samples in that file will be available to you.

If you select **Yes**, all files in the sequence will open and the samples from the entire session are available as if you had opened a single file.

***Note:*** *If you select **View | Samples List | Details**, you can see the pathname for each sample.*

When you open a sequence of files, the software looks for the first file of that sequence (i.e., the one with the .O30 extension and opens all files in sequence beginning with that file). If a sequence file is unavailable (for example, it has been deleted, moved or corrupted), the software opens the files until it comes to the missing file. For example, if you try to open a sequence of files that contains seven files and the fourth file is missing, only the first three files can be opened. Files five, six, and seven are "orphaned." These remaining files (5, 6, and 7) can only be opened individually, not as a sequence.

APPENDIX F

# Error Messages

This appendix lists the messages you may encounter when using the software and suggests the action you should take.

When an instrument error occurs, Aerosol Instrument Manager® software displays a yellow error icon in the lower right corner of the graph or table. Normally this is a green icon OK. To see a description of the error, move the cursor so that it hovers over the icon. If there is more than one error you will see a list of errors.

This icon and the error descriptions are available when you open previously collected data files as well.

**Table F-1**
Error Messages for Optical Particle Sizer Spectrometer

| Error Message | Description |
|---|---|
| <file> already exists. Do you want to replace it? | The file you selected for File\|New is an existing data file. If you would like to overwrite the file, select **Yes**. Otherwise, select **No** and enter a different file name in the New dialog. |
| Cannot communicate with the instrument. Please check that it is connected and turned on, and that the IP address is correct. | Communications error, the software cannot communicate with the hardware. Please check the items indicated in the message. |
| Instrument connected is not model 3330. | Aerosol Instrument Manager® software connected to an instrument but the model of the instrument is not an OPS 3330 so Aerosol Instrument Manager® software will disconnect. |
| The file selected does not contain any data records. | The data file is either empty or corrupt and cannot be opened by the Aerosol Instrument Manager® software. |
| Access to <filename> was denied. | The file cannot be opened. Make sure it is not a Read Only file. |
| The file you have selected is part of a sequence of files. Do you want to view all the files? | You have selected a file that is part of a sequence of files. You can select **Yes** to view all the files or **No** to view only the file you initially selected. |
| Cannot find a file (<filename>) in the sequence of files associated with <filename>. Only the samples loaded will be available. | Warning to let you know that the sequence of files has a gap and the program cannot load all of the files. |

| Error Message | Description |
|---|---|
| Cannot find a file (<filename>) in the sequence of files associated with (<filename>). Only the samples loaded will be available. | One or more files in a file sequence cannot be found. The file(s) have either been moved or deleted. |
| Some samples have been marked for deletion. Do you want them permanently removed? | If you select **Yes**, the samples marked for deletion will be removed from the file. If you do not want the samples to be deleted, select **No**. |
| Density cannot be zero. | Data Settings page of the Properties dialog. The value for Density must be non-zero. |
| The repeat interval must be longer than the time for one set of samples. | Scheduling page of the Properties dialog.<br>The repeat interval is the time from the start of one set of samples to the start of the next set of samples when collecting more than one set. The repeat interval cannot be smaller than the time required to collect one set of samples. |
| The repeat interval cannot be longer than 99 days. | Scheduling page of the Properties dialog. |
| The Hours field cannot be blank. | Scheduling page of the Properties dialog. |
| The Minutes field cannot be blank. | Scheduling page of the Properties dialog. |
| The number of samples cannot be zero. | Scheduling page of the Properties dialog. |
| The sample length cannot be zero. | Scheduling page of the Properties dialog. |

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## Y



## Z

# Reader's Comments

Please help us improve our manuals by completing and returning this questionnaire to the address listed in the "About This Manual" chapter. Feel free to attach a separate sheet of comments.

**Manual Title** Aerosol Instrument Manager® Software for Optical Particle Sizer (OPS) Spectrometers **P/N** 6004402 **Rev.** A

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   _____

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|---|---|---|---|
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P/N 6004402 Rev A  Printed in U.S.A.