

USER'S GUIDE

SKC ENVIRONMENTAL PARTICULATE AIR MONITOR

**MODEL SKC EPAM-5000
DOC# HD50706**

SKC Inc.
863 Valley View Road
Eighty Four, PA 15330

Phone: (724) 941-9704
Fax: (724) 941-1369



Manufactured By: Environmental Devices Corporation

Model SKC EPAM-5000 User's Guide



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Chapter 1 - Introduction to Model SKC EPAM-5000

Chapter 1

Introduction to Model SKC EPAM-5000

Chapter Overview

Introduction This chapter gives a complete overview of Model SKC EPAM-5000.

This chapter:

- Introduces and describes EPAM-5000.
 - Explains operating principles of the EPAM-5000.
 - Identifies features, specifications and components of EPAM-5000.
-

In this chapter This chapter contains the following topics.

Topic	See Page
Introduction to the EPAM-5000	1-2
Overview of the EPAM-5000	1-4
Real-Time Dust Monitoring Principles	1-6
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Introduction to the SKC EPAM-5000

Introduction The SKC EPAM-5000 is a high sensitivity real-time particulate monitor designed for ambient environmental and indoor air quality applications. This unit combines traditional filter techniques with real-time monitoring methods. These techniques combined overcome limitations of all other aerosol monitoring products.



Figure 1.2. Picture of the Haz-Dust.

Continued on next page

Introduction to the SKC EPAM-5000, Continued

Comparison of methods The traditional and real-time dust monitoring methods are described below.

Description of traditional method Air is drawn by a vacuum pump through a 47mm diameter membrane filter EPA FRM Style. The fibers and particles collected on the membrane filter must be counted or weighed in a laboratory for further analysis.

Advantages of traditional method¹

- EPA or OSHA compliance reference method.
- High level of specificity and accuracy.
- Collection of dust particles, which are available for further chemical analysis.

Description of real-time method Dust particles are drawn into the sensor head and are detected once every second. Dust concentrations are instantaneously calculated and displayed on the SKC EPAM-5000's LCD. All data points are stored in memory for later analysis.

Advantages of real-time method¹

- Immediate estimations of the concentration of a contaminant, permitting on-site evaluations.
- Provision of permanent 24-hour records of contaminant concentrations using continuous monitors.
- Internal audible alarm to warn workers of approaching hazardous situations.
- Reduction of number of manual filter tests.
- Reduction of number of laboratory analyses.
- Provision of more convincing evidence for presentation at hearings and litigation proceedings.
- Reduced cost of obtaining individual results.

¹ "The Industrial Environment - It's Evaluation & Control", U.S. Department of Health & Human Services, CDC, NIOSH, ©1973.

Overview of the SKC EPAM-5000

Ease of use

- The user controls all functionality and programming using menus displayed on a high contrast LCD.
 - A 24-hour rechargeable battery capacity.
 - Automatic clean air purging of sensor for increased stability and accuracy.
 - Internal temperature compensation for ambient use.
-

General Information

- The LCD displays real-time concentration in milligram per cubic meter (mg/m^3) in accordance with EPA or OSHA Reference Methods.
 - Statistical information of TWA, STEL, Max and Min levels can be viewed instantly.
 - The SKC EPAM-5000 is calibrated using Arizona Road Dust (ARD) against NIOSH method 0600 for Respirable dust with a $\pm 10\%$ accuracy.
 - The calibration of the SKC EPAM-5000 can be adjusted to compensate for changes in particle composition and distribution.
-

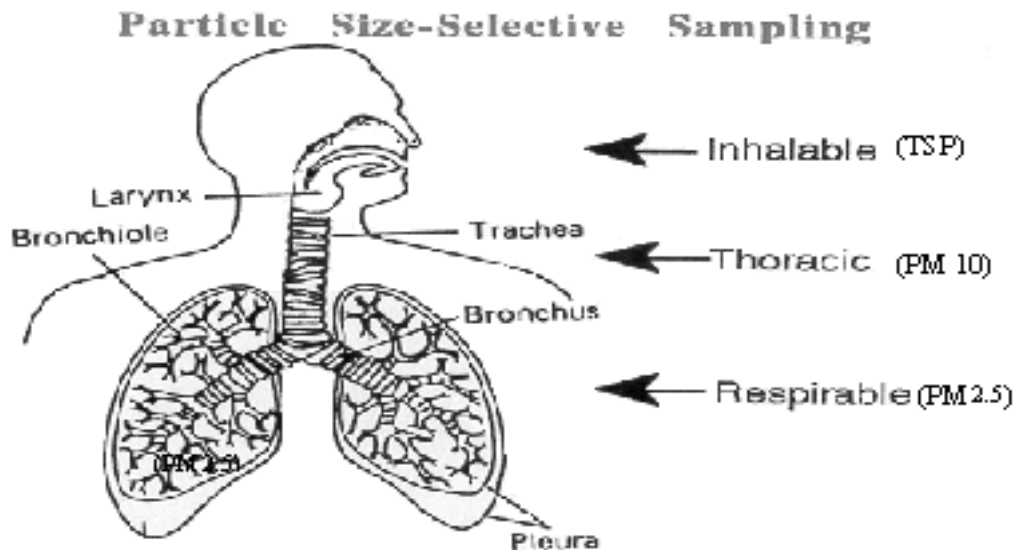


Figure 1.4. Diagram showing breathing zones of Inhalable, Thoracic, and Respirable dust particles.

Continued on next page

Overview of the SKC EPAM-5000, Continued

DustComm Pro Software

DustComm Pro supplied software is designed for more detailed analysis of sampled data. Pull down menus provide for a user friendly environment to store and analyze data and print management ready reports

Data can easily be exported in comma-delimited ASCII Text Files importable into spreadsheet programs such as Microsoft Excel and Lotus 1-2-3.

DustComm Pro Software is used for downloading the information on Windows XP, 2000, NT, and ME PCs.

The data plots provided with DustComm Pro enable:

- Detailed statistical analysis.
 - Creation of graphics and charts.
 - Mathematical correction of particle characteristics when aerosol significantly differs from calibration dust.
-

Real-Time Dust Monitoring Principles

Principles

- The SKC EPAM-5000 uses the principle of near-forward light scattering of an infrared radiation to immediately and continuously measure the concentration in mg/m^3 of airborne dust particles.
- This principle utilizes an infrared light source positioned at a 90-degree angle from a photo detector.
- As the airborne particles enter the infrared beam, they scatter the light. The amount of light received by the photo detector is directly proportional to the aerosol concentration.
- A unique signal processes internally and compensates for noise and drift. This allows high resolution, low detection limits and excellent base line stability.

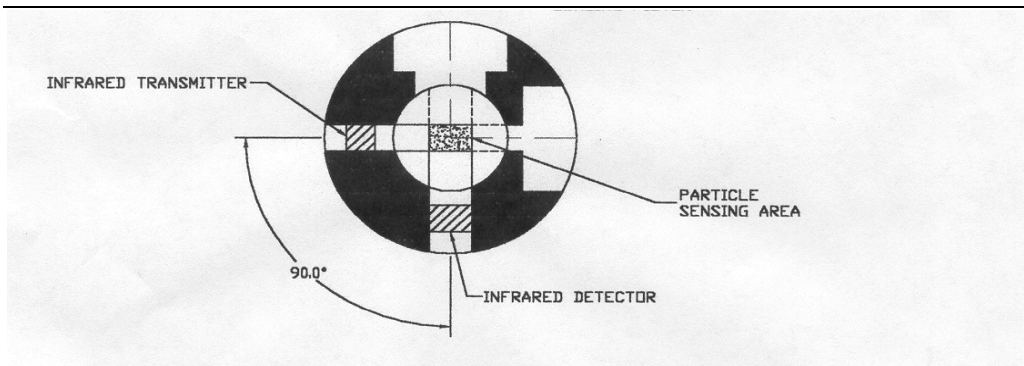


Figure 1.5. Diagram showing the principle of near-forward light scattering used in the SKC EPAM-5000.

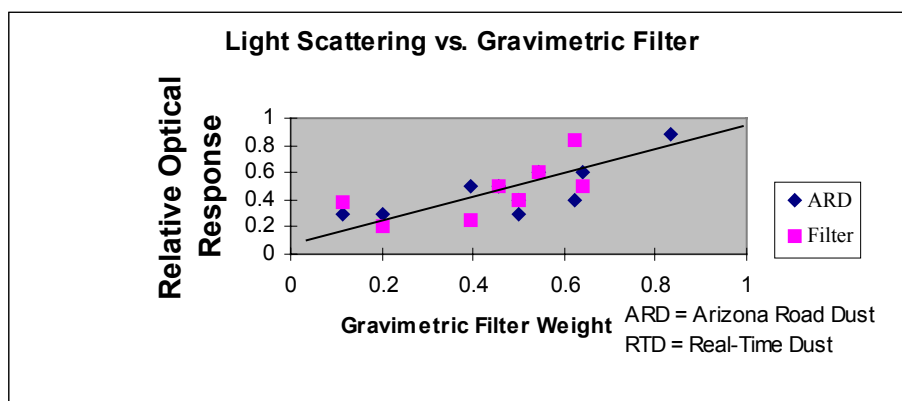


Figure 1.6. Graph illustrating the principle of near-forward light scattering.

Features

Introduction

The EPAM-5000 provides a unique combination of features to provide superior data quality, ease of use, and flexibility to the user. Below is a partial list of distinctive features.

Real-time display of

- Particulate exposure levels.
 - TWA, STEL, Min, and Max levels.
 - PM 1.0, PM 2.5, PM 10, or TSP.
 - Stored data by location code.
-

Functional features

- Calibrated to NIOSH methods for lung damaging particles.
 - In line concurrent filter samples for gravimetric analysis.
 - High sensitivity of 0.001 to 20 mg/m³ (1 µg/m³ – 2000 µg/m³).
 - Interchangeable size-selective sampling inlets.
 - Internal air sampling pump.
 - Auto purging sensor.
 - Easy user access to rechargeable battery and internal filter.
-

Operational features

- On-screen programming of sampling and data storage parameters.
 - Real-time clock.
 - User selectable audible alarm.
 - In-field zero and span check of instrument calibration.
-

Data management

- Choice of 1 second, 1 minute, 10 second, or 30 minute averaging/storage intervals.
 - Up to 15 months of sample/record time.
 - Memory storage of up to 21,600 data points, which can be, distributed into a maximum of 999 location files.
 - Data translation to ASCII text files, importable into Excel or Lotus 1-2-3.
 - DustComm Pro software offers comparative graphical and statistical analysis.
-

Specifications

Introduction The EPAM-5000 meets the following specifications.

Specifications

Display: Large alphanumeric LCD- 4 line, 20-character display

Operation: Four key splash proof membrane switch – menu driven

Calibration: NIOSH gravimetric method

Sensing range: .001-20.0 mg/m³ .01-200.0 mg/m³ (optional)

Particle size range: 0.1-100 µm

Precision: +/- 0.003 mg/m³ (3 µm/m³)

Accuracy: +/-10% to NIOSH #0600 using ARD

Sampling flow rate: 1.0 – 4.3 liters/minute

Filter cassette: 47mm disposable EPA FRM Style

Alarm output: 90db at 3ft.

Recording time: 1 sec. To 15 months

Sampling rate: 1 sec., 10 sec., 1 min., and 30 min.

Data storage: 21,600 data points

Security code: 4-digit combination

Memory & time storage: > 10yrs

Real-time clock & data display

Data display: concentration in mg/m³

& TWA, MAX, MIN, STEL, DATE/TIME

Digital output: RS-232

Operating Temperature: -10°C to 50°C

Storage Temperature: -20 to 60°C

DustComm Pro software: Windows™ driven for graphical and data translation

Power: Rechargeable battery

Operating time: ≥ 24 hours

Charging time: 22 hours

Humidity: 95% non-condensing

Dimensions (case): 14.0" x 6.0" x 10.0"

Weight: 12 lbs.

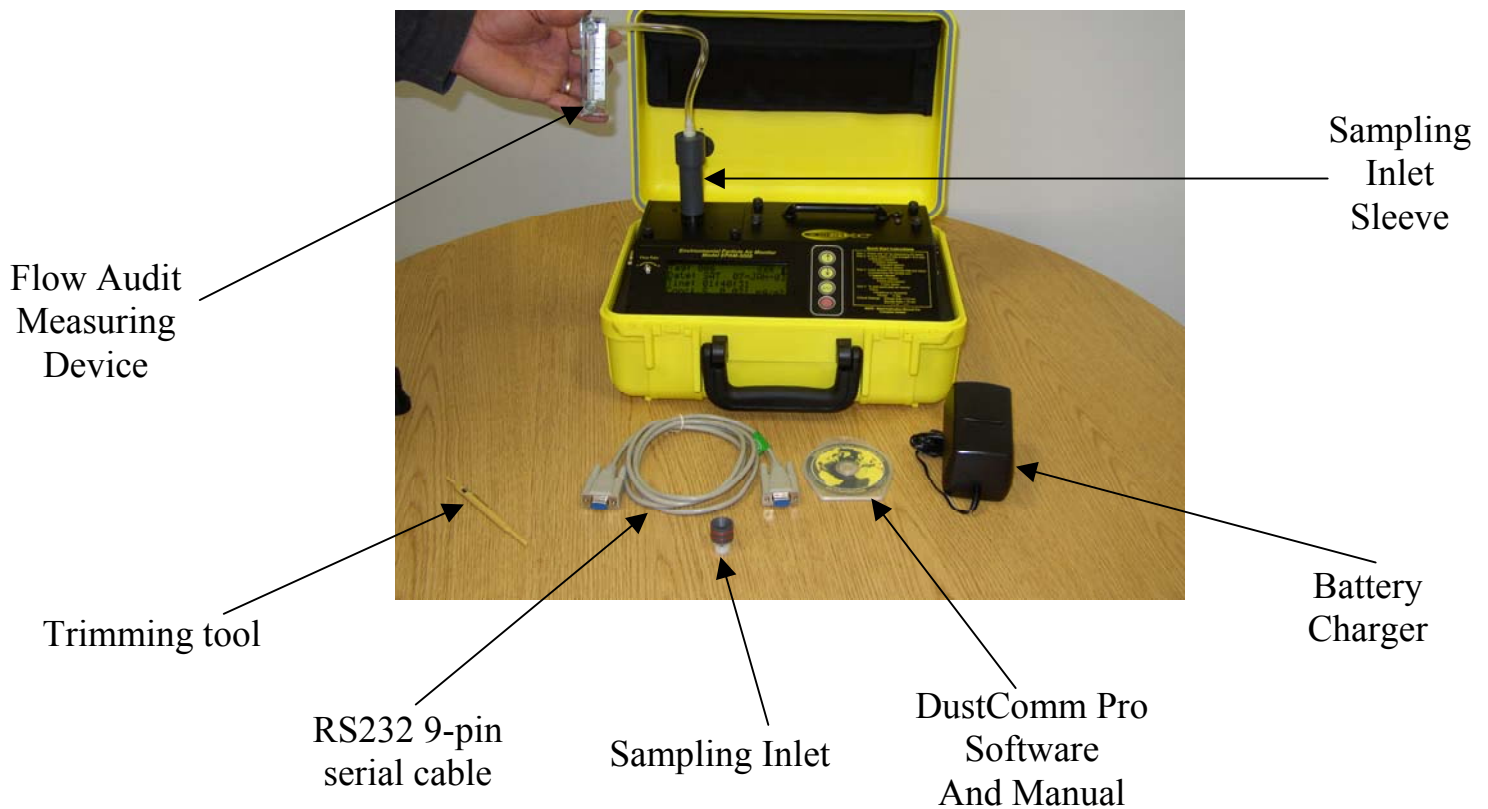
Components

The following components ship with the SKC EPAM-5000.

Components

- SKC EPAM-5000 Monitor.
 - Rechargeable battery pack.
 - Battery charger.
 - Trimming tool.
 - EPAM Media CD-ROM Includes: DustComm Pro Software and Instruction Manual.
 - RS232 9-pin serial cable (female to male).
 - TSP Sampling inlet (1.0 μm , 2.5 μm , or 10 μm sampling inlet optional).
 - Flow Audit Measuring Device Adapter
 - Flow Audit Measuring Device.
-

Figure 1-7 EPAM-5000



Chapter 2 - Operating Parameters of the SKC EPAM-5000

Chapter 2

Operating Parameters of the EPAM-5000

Chapter Overview

Introduction This chapter describes the steps involved in starting the EPAM-5000 and configuring its operating parameters.

Note: The EPAM-5000 is preprogrammed with default settings of 1 minute Sampling rate. If user desires not to change default settings then the user only needs to turn unit on and press enter button to run monitor. This allows for immediate sampling for emergency response.

In this chapter This chapter contains the following topics.

Topic	See Page
Turning the EPAM-5000 on and off.	2-2
Using the Menu.	2-3
Setting the Date and Time.	2-4
Setting the Alarm.	2-5
Clearing the Memory.	2-6

Turning the SKC EPAM-5000 On and Off

Introduction Power can be supplied to the SKC EPAM-5000 either from its internal battery or from the provided AC power transformer (Battery Charger).

Note: THE BATTERY SHOULD BE FULLY CHARGED before each use. To charge battery use the EDC supplied charger only. LED indicator on battery holder will turn green when the battery is fully charged. Charge time is approximately 22 hours and will run for approximately 24 hours. To check battery status see Page 5-8.

Power-On Press the **ON/OFF** key to turn the EPAM-5000 monitor on.

Result: The unit will turn on and the Title Screen will appear.

Power-Off Press the **ON/OFF** key a second time to turn the SKC EPAM-5000 off.



Figure 2.1. Diagram of Key Pad on EPAM-5000.

Using the Menu

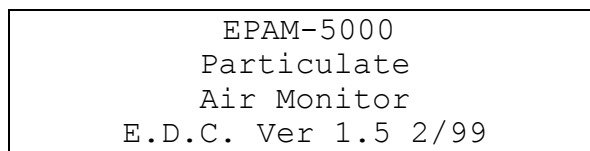
Introduction The EPAM-5000 menu appears on the 4x20-character liquid crystal display (LCD).

Note: See Appendix A for menu option flow charts.

Accessing the main menu Press **ENTER** from the Title Screen to access the Main Menu.

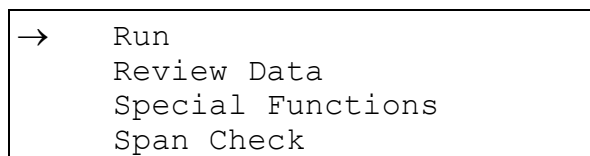
Using the menu The EPAM-5000 is operated using the following menu selections.

Selection	Function
<ON/OFF>	Turns the EPAM-5000 on and off.
<ENTER>	Activates the selected option.
< → >	Selection Arrow located on the LCD display. Indicates the selected menu option.
< ↑ >	Scrolls the Selection Arrow up one line in a menu list.
< ↓ >	Scrolls the Selection Arrow down one line in a menu list.



```
EPAM-5000
Particulate
Air Monitor
E.D.C. Ver 1.5 2/99
```

Figure 2.2. The Title Screen of the EPAM-5000.



```
→ Run
Review Data
Special Functions
Span Check
```

Figure 2.3. The Main Menu of the EPAM-5000.

Setting the Date and Time

Introduction The date and time are pre-set by the factory to Eastern Standard Time and are maintained by an internal clock. It may be necessary to change the date and time due to local time zones or daylight savings time.

Note: It is important that the system date and time are correct for accurate record keeping.

Date and Time settings Time is entered and displayed in military time format.
Date is entered and displayed in European format (i.e., MON 17-DEC-01).

View settings Follow the steps in the table below to check the unit's date and time.

Step	Action
1	Select Special Functions from the Main Menu.
2	Select Date/Time .
3	Select View Date/Time .
	Result: The unit's current date and time will display.
4	Press ENTER to return to the View Date/Time Screen.

Change settings Follow the steps in the table below to change the unit's date and time.

Step	Action								
1	Select Special Functions from the Main Menu.								
2	Select Date/Time .								
3	Select Set Date/Time .								
4	Enter the correct date and time using the steps in the table below.								
	<table border="1"> <thead> <tr> <th>To...</th> <th>Press...</th> </tr> </thead> <tbody> <tr> <td>Increase the value of the selected digit.</td> <td>< ↑ ></td> </tr> <tr> <td>Decrease the value of the selected digit.</td> <td>< ↓ ></td> </tr> <tr> <td>Select the next digit or field.</td> <td>ENTER</td> </tr> </tbody> </table>	To...	Press...	Increase the value of the selected digit.	< ↑ >	Decrease the value of the selected digit.	< ↓ >	Select the next digit or field.	ENTER
To...	Press...								
Increase the value of the selected digit.	< ↑ >								
Decrease the value of the selected digit.	< ↓ >								
Select the next digit or field.	ENTER								
5	Press ENTER when the correct information has been entered.								
	<table border="1"> <thead> <tr> <th>To...</th> <th>Select...</th> </tr> </thead> <tbody> <tr> <td>Update the selected date and time.</td> <td>Set Date/Time</td> </tr> <tr> <td>Return to the Date/Time screen without saving changes.</td> <td>Cancel</td> </tr> </tbody> </table>	To...	Select...	Update the selected date and time.	Set Date/Time	Return to the Date/Time screen without saving changes.	Cancel		
To...	Select...								
Update the selected date and time.	Set Date/Time								
Return to the Date/Time screen without saving changes.	Cancel								

Setting the Alarm

Introduction An audible alarm can be set to alert the worker of approaching threshold limits.

Alarm settings The concentration level must be set to the defined agency standard for the particulate type being sampled.

Note: See Appendix B for a partial listing of the most common dust particulates and their corresponding concentration levels.

Using the alarm Follow the steps in the table below to set the alarm level.

Step	Action	
1	Select Special Functions from the Main Menu.	
2	Select Set Alarm .	
3	Enter the appropriate concentration level using the table below.	
	To...	Press...
	Increase the value of the selected digit.	< ↑ >
	Decrease the value of the selected digit.	< ↓ >
	Select the next digit.	ENTER
4	Press ENTER after the last digit is entered.	
5	To run unit with alarm select Alm-Continue, or Alm-overwrite to activate alarm setting in run mode.	
	Result: The alarm has been set and the Main Menu appears.	

Clearing the Memory

Introduction

The memory of the EPAM-5000 can be cleared at any time.

Note: All data points in all locations will be deleted from memory.

Clearing memory

Follow the steps in the table below to clear the memory of the EPAM-5000.

Step	Action
1	Select Special Functions from the Main Menu.
2	Select System Options .
3	Select Erase Memory .
4	Select Yes to clear memory. Note: Selecting No will cancel the process without clearing memory.

Chapter 3 - Operating the SKC EPAM-5000

Chapter 3

Operating the SKC EPAM-5000

Chapter Overview

Introduction This chapter describes and diagrams operation procedures of the EPAM-5000.

In this chapter This chapter contains the following topics.

Topic	See Page
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1.0 micron Dust Particulates	3-3
2.5 micron Dust Particulates	3-4
10 micron Dust Particulates	3-5
Auto-Zero	3-6
Manual-Zero	3-7
Sampling	3-9
Location Codes	3-12
Reviewing Stored Data	3-13

Selecting The Particle Size

Introduction

The inlet system of the SKC EPAM-5000 can be configured to sample TSP, PM 1.0, 2.5, 10.0 μm dust particulates. The following pages detail the selection process for each of these particle types. Impactor Sleeve holds one optional accessory.

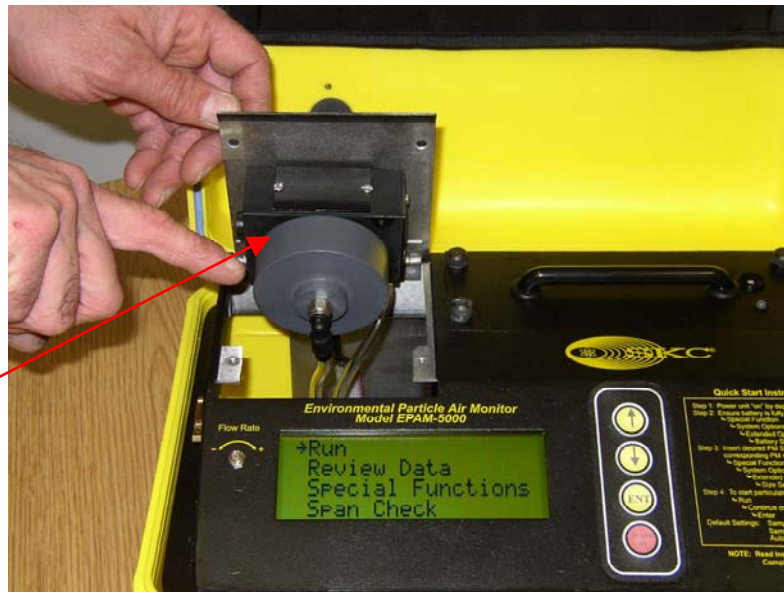


Figure 3-1. Picture: A) Impactor Jet, B) Impaction cup, and C) Impactor Sleeve. For TSP sampling use impactor sleeve without impactor. One Size Selective Inlet is provided with EPAM-5000. Impactors are engraved on bottom of jet.

1.0um Dust Particulates

Follow the steps in the table below to select PM-1.0 dust particulates.

Step	Action
1	Select Special Functions from the Main Menu.
2	Select System Options .
3	Select Extended Options .
4	Select Size Select .
5	Select 1.0 µm – E (The letter E will be displayed on LCD during run mode to identify for the user that 1.0 µm has been selected.) <u>Result:</u> The Main Menu is displayed.
6	Insert the sampling inlet into the sensor head of the EPAM-5000. Note: If also collecting concurrent 47mm EPA FRM Style filter samples place a clean gravimetric filter in the filter cassette. The flow rate should be checked each time a new gravimetric filter is used. See page 5-5 for information on checking the flow rate.
7	Attach the filter cassette to the sensor head of the EPAM-5000. See diagram below.
8	Turn to page 3-7 and follow the instructions to Manual-Zero the EPAM-5000.



Install 47mm filter if desired.
Remove filter holder by unscrewing bottom round cover.

Figure 3-2. Diagram of sensor lid. To unlock sensor lid unscrew pem screw located on right side of sensor lid to expose the filter cassette. ***NOTE:** When closing sensor cover be sure not to tighten pem screw too tightly the spring inside the screw can break.

2.5um Dust Particulates

Note: 2.5- μm size select is the default setting of the EPAM-5000.

Follow the steps in the table below to select PM2.5 dust particulates.

Step	Action
1	Select Special Functions from the Main Menu.
2	Select System Options .
3	Select Extended Options .
4	Select Size Select .
5	Select 2.5 . Result: The Main Menu is displayed.
6	Insert the inlet into the sensor head of the EPAM-5000. Note: If also collecting concurrent 47mm EPA FRM Style filter samples place a clean gravimetric filter in the filter cassette. The Flow Rate should be checked each time a new gravimetric filter is used. See page 5-5 for information on checking the flow rate.
7	Attach the filter cassette holder to the sensor of the EPAM-5000.
8	Turn to page 3-7 and follow the instructions to Manual-Zero the EPAM-5000.

10um Dust Particulates

When using the SKC EPAM-5000 monitor for PM-10 sampling a suitable entry must be used.

Selecting PM-10

Follow the steps in the table below to select PM-10 dust particulates.

Step	Action
1	Select Special Functions from the Main Menu.
2	Select System Options .
3	Select Extended Options .
4	Select Size Select .
5	Select PM10 . Result: The Main Menu is displayed.
6	Insert the inlet into the sensor head of the EPAM-5000. Note: If also collecting concurrent 47mm EPA FRM Style filter samples place a clean gravimetric filter in the filter cassette. The Flow Rate should be checked each time a new gravimetric filter is used. See page 5-5 for information on checking the flow rate.
7	Attach the filter cassette holder to the sensor of the EPAM-5000. See figure number 3-2 on page 3-3.
8	Turn to page 3-7 and follow the instructions to Manual-Zero the EPAM-5000.

Continued on next page

Auto-Zero

Introduction

Auto-Zero purging feature automatically adjusts for baseline drift due to severe ambient temperature change.
This feature is a default setting on the EPAM-5000.
The Auto-Zero feature purges the sensor optics with clean air and re-establishes the baseline every 30 minutes.

Auto-Zero

To deactivate or reactivate the Auto Zero purging feature follow the table below.

Step	Action
1	Select Special Functions from the Main Menu.
2	Select System Options.
3	Select Extended Options.
4	Select Calibration Options.
5	Select Auto Zero.

Manual-Zero

Introduction Manual-Zero sets the measurement baseline of the EPAM-5000 to zero mg/m³. The Manual-Zero check should take place prior to beginning a new set of measurements.

Note: If using the Auto-Zero setting (default) the EPAM-5000 automatically zeroes baseline every 30 minutes.

Manual-Zero Follow the steps in the table below to Manual-Zero the EPAM-5000.

Note: The battery should be fully charged. Check battery status as described in Chapter 5 Section 8.

Step	Action	
1	Be sure the appropriate sampling inlet is attached to the sensor inlet of the EPAM-5000 using the table below.	
	If sampling...	Then insert the...
	PM1.0 Particulates	1.0 impactor jet
	PM2.5 Particulates	2.5 impactor
	PM10 Particulates	10 impactor jet
	TSP Particulates	Impactor sleeve only

Continued on next page

Manual-Zero, Continued

3	Select Special Functions from the Main Menu.
4	Select System Options .
5	Select Extended Options .
6	Select Calibration . Result: Screen appears with manual zero at the top.
7	Select Manual-Zero . Select Manual-Zero again. Note: Wait approximately 99 seconds. The unit automatically executes the steps necessary to reestablish the baseline. Result: The Main Menu is displayed when the manual-zero process is complete. Notes: The EPAM-5000 has an auto zero purging feature that automatically purges the sensor and performs an auto zero to reestablish the baseline approximately every 30 minutes. An X inside a box appears in right hand corner of the display when the instrument is auto zeroing.

Sampling

Introduction Once you have selected a Particle Size and completed the Manual-Zero process the EPAM-5000 is ready to begin sampling.

Conditions The following conditions should be met before starting the sampling process.

Condition...	For further Information See Page...
The correct particle size must be selected.	3-2
The correct sampling inlet must be attached.	3-2 –3-5
The date and time must be checked and/or set.	2-4
The Manual-Zero process must be complete.	3-7
The alarm level must be set if sampling with the alarm feature.	2-5

Sampling Follow the steps in the table below to begin the particle sampling.

Step	Action						
1	Turn unit on and press enter.						
2	Select Run, and Choose Continue or Overwrite data.						
3	Choose the memory storage type using the table below.						
	<table border="1"> <thead> <tr> <th>To...</th> <th>Select...</th> </tr> </thead> <tbody> <tr> <td>Erase all previously recorded data points in all locations.</td> <td> Overwrite, then Select Yes to confirm, Note: Selecting No will cancel sampling process without effecting memory. </td> </tr> <tr> <td>Add data points to the next consecutive location.</td> <td>Continuation.</td> </tr> </tbody> </table> <p>Note: See page 3-13 for explanation of location codes.</p>	To...	Select...	Erase all previously recorded data points in all locations.	Overwrite, then Select Yes to confirm, Note: Selecting No will cancel sampling process without effecting memory.	Add data points to the next consecutive location.	Continuation.
To...	Select...						
Erase all previously recorded data points in all locations.	Overwrite, then Select Yes to confirm, Note: Selecting No will cancel sampling process without effecting memory.						
Add data points to the next consecutive location.	Continuation.						

Continued on next page

Sampling, Continued

4	Sample and record the data using the table below.	
	To Sample...	Select...
	Without the alarm feature	Run
	With the alarm feature	Alm-Continue

Results:

- The internal pump is activated and the sampling process begins.
- The Run Screen is displayed.

Note: Maximum sampling time is based on the sampling interval selected in step number two.

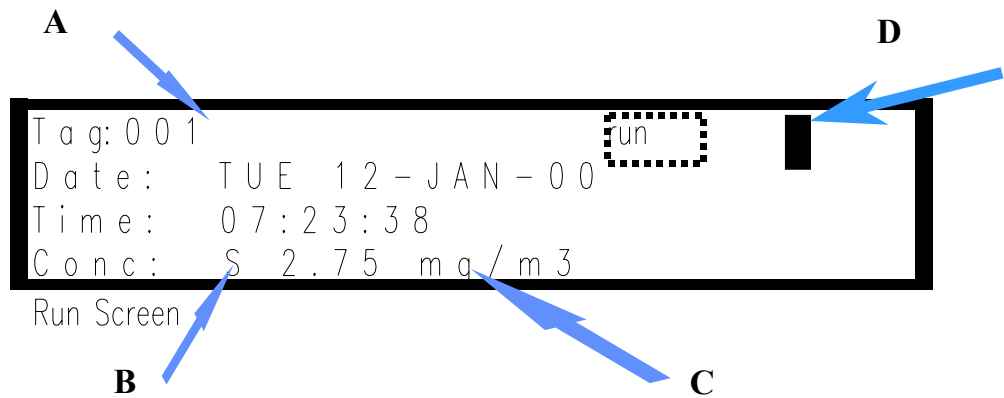


Figure 3.10. The Run Screen. The table below describes the diagram details.

Sampling, Continued

Detail	Explanation
A	Indicates Location Code of data being sampled. A record should be kept of the site that corresponds to each location code. Note: See page 3-11 for explanation of location codes.
B	Particulate type being sampled. 1.0 μm = E 2.5 μm = S 10 μm = M TSP = L
C	Concentration. A constant negative number may indicate the baseline of the unit is not set to zero and the Manual-Zero process should be performed or Auto Zero function should be turned on see Chapter 3 page 3-6.
D	Battery Status Bar is displayed in the upper right hand corner when the unit is in the run mode. This status is a relative indicator of battery voltage versus time.

Ending the Sampling process

Press **ENTER** to stop data collection and return to the Main Menu.

Note: The EPAM-5000 default settings are for a size select of 2.5 μm , 1 min. sample rate with auto zero purge on.

Selecting the Sample Rate.

Follow the steps in the table below to select the sample rate.

Step	Action										
1	Select Special Functions from the Main Menu.										
2	Select System Options .										
3	Select Sample Rate .										
	<table border="1"> <thead> <tr> <th>Select...</th> <th>For maximum sampling time of...</th> </tr> </thead> <tbody> <tr> <td>1 Second</td> <td>6 Hours</td> </tr> <tr> <td>10 Seconds</td> <td>60 Hours</td> </tr> <tr> <td>1 Minute</td> <td>15 Days</td> </tr> <tr> <td>30 Minutes</td> <td>15 Months</td> </tr> </tbody> </table> <p>Note: A sample is taken each second and averaged by the sample interval time selected.</p>	Select...	For maximum sampling time of...	1 Second	6 Hours	10 Seconds	60 Hours	1 Minute	15 Days	30 Minutes	15 Months
Select...	For maximum sampling time of...										
1 Second	6 Hours										
10 Seconds	60 Hours										
1 Minute	15 Days										
30 Minutes	15 Months										

Location Codes

Introduction The EPAM-5000 assigns a location code called tag number to each sampling sequence. The active location is indicated in the Data Record Screen (See figure 3.10).

Maximum location codes The EPAM-5000 can store a total of 21,600 data points, which can be distributed into a maximum of 999 locations.

Assigning location codes The location code assigned to the site is determined by the memory storage type selected in step number three of the sampling process (page 3-9).

Use the table below to identify the location code being used.

Data storage type selected...	The SKC EPAM-5000 Assigns...
Continuation	The Next Consecutive Value as the Location Code. Example: If data was previously stored in Tag #001 and #002 the data being collected will be stored in Tag #003.
Overwrite	001 as the Tag Number and all previously stored data points in all locations are erased.

Reviewing Stored Data

Introduction The EPAM-5000 provides extensive capabilities for reviewing internally stored data and statistics on the LCD or downloading to a PC using DustComm Pro Software (Chapter 4).

LCD display The following information can be displayed on the LCD.

Display	Description Tag #
Date	Date of sampling.
Start	Time sampling began.
Stop	Time sampling was terminated.
Time	Time of occurrence of reported statistic.
MAXIMUM Sample	Highest concentration of dust particles.
MINIMUM Sample	Lowest concentration of dust particles.
T.W.A.	Time weighted average concentration of dust particles.
Elapsed	Elapsed time of the time weighted average.
S.T.E.L.	Short-term exposure limit.

Viewing data on the LCD Follow the steps in the table below to review stored information and statistics.

Step	Action	
1	Select Review Data .	
2	Select Statistics .	
3	Determine your next step using the table below.	
	If...	Then the...
	Memory holds data points in other locations.	The Scanning Memory Screen displays. Go to step 7.
	Memory has been cleared of all data points.	No Data Recorded.
4	Select the Location using the table below.	
	To review...	Select...
	A different Location	New Tag XXX and go to step 7.

Continued on next page

Reviewing Stored Data, Continued

5	Enter the desired Location in the Location Select Screen using the table below.	
	To...	Press...
	Increase the value of the selected digit.	< ↑ >
	Decrease the value of the selected digit.	< ↓ >
	Select the next digit or field.	ENTER
6	Press ENTER when the desired location code has been entered. Result: The location is shown on the display. If the location is being reviewed for the first time scrolling dots will appear indicating the microprocessor is computing data.	
7	The first of five statistics screen appears when data is computed. Scroll through the statistics screens using the table below.	
	Press...	To Scroll...
	< ↓ >	Forward through the statistic screens.
	< ↑ >	Backward through the statistic screens.

To download data to a PC using the provided DustComm Pro Software select download from review data menu and proceed to Chapter 4.

Chapter 4 – DustComm Pro V.1.2

Introduction to the DustComm Software

Introduction

DustComm is a powerful and flexible Windows application software package designed for use with the SKC EPAM-5000 Monitor.

DustComm is both communications software that enables stored project data to be downloaded to a PC, and a data manipulation tool, enabling detailed analysis and reporting of sampled data.

Spreadsheet applications

DustComm easily translates data into spreadsheet ASCII text files. These files can be open into spreadsheet programs such as Microsoft Excel

Data plots

The data plots provided with DustComm enable:

- Detailed statistical analysis.
 - The creation of graphics and charts.
 - The mathematical correction of particle characteristics when aerosol significantly differs from calibration dust.
-

Installing DustComm

Introduction DustComm installation is easy and quick, the entire process should take less than 5 minutes.

Minimum system requirements Windows ME or Higher.
4 MB available disk space.
8 MB RAM.

Software installation Follow the steps in the table below to install DustComm.

Note: It is assumed that the CD-Rom Drive is the “D” Drive. Substitute D with the appropriate drive letter if necessary.

Step	Action
1	Start Windows.
2	Close all open applications.
3	Insert <i>Installation Disk</i> into the D drive.
4	Open My Computer
5	Select the folder named “DustComm V1.2” and double click to enter.
6	Select the icon named “Setup” and double click. See Figure1.
7	Follow the installation wizard steps.

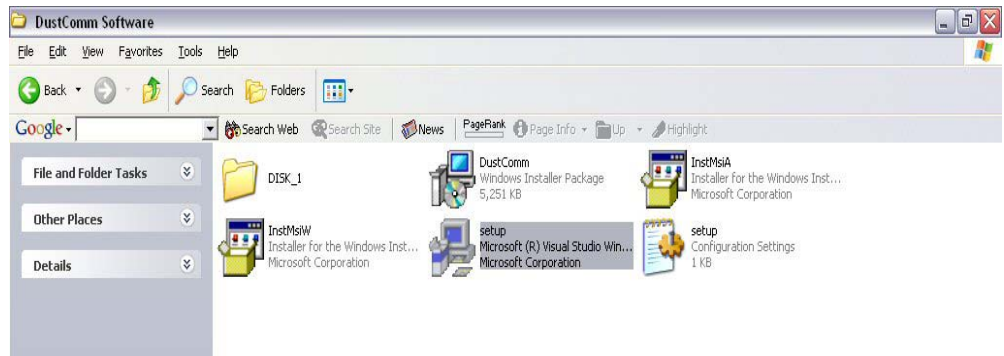


Figure 1: DustComm Software Folder with “Setup” Selected in Windows XP.

Loading the DustComm Software

Windows ME Follow the steps in the table below to load the DustComm software if using Windows ME.

Step	Action
1	Select the Start Menu.
2	Select Programs.
3	Select the folder EDC DustComm Pro 1.2
4	Select DustComm Pro 1.2

Windows NT, 2000 & XP Follow the steps in the table below to load the DustComm Software if using Windows NT, 2000 & XP.

Step	Action
1	Double Click on the icon on your desktop. NOTE: If shortcut icon does not appear on desktop follow the steps for Windows ME.

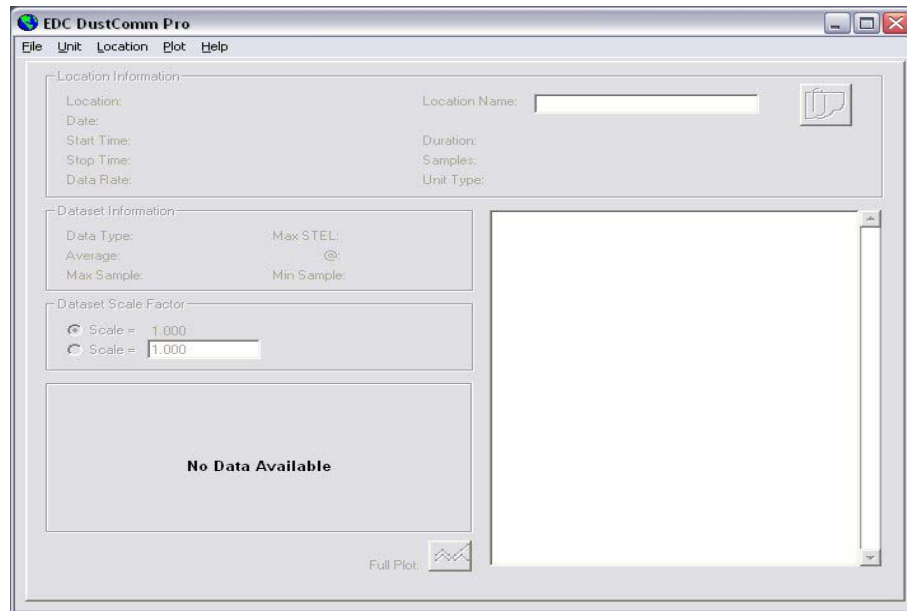


Figure 2. DustComm Screen immediately after loading software.

Menu Selections

Introduction

Figures 3 through 5 show each of the DustComm menu options.

Note: If a menu option is displayed in light type it is not available during the current task.

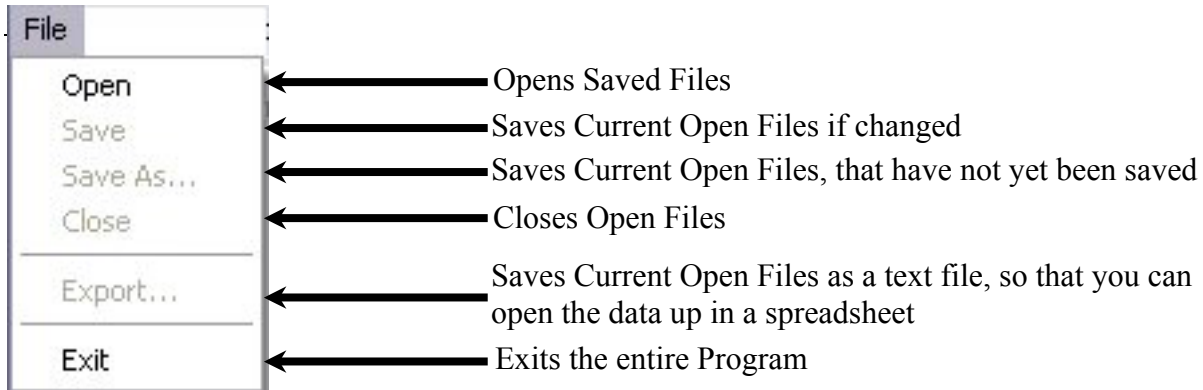


Figure 3. File Menu Options.

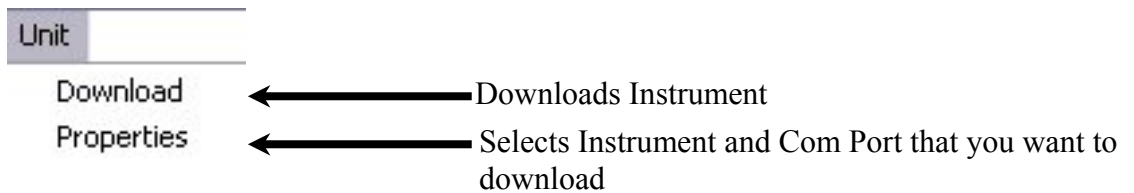


Figure 4. Unit Menu Options.

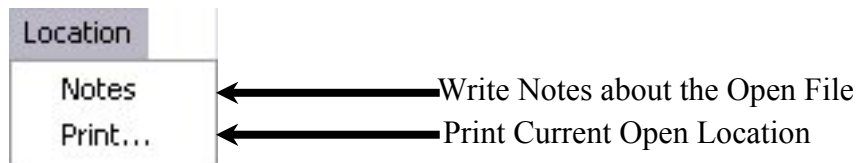


Figure 5. Location Menu Options.

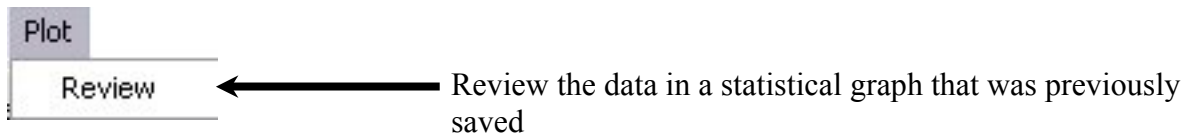


Figure 6. Plot Menu Options.

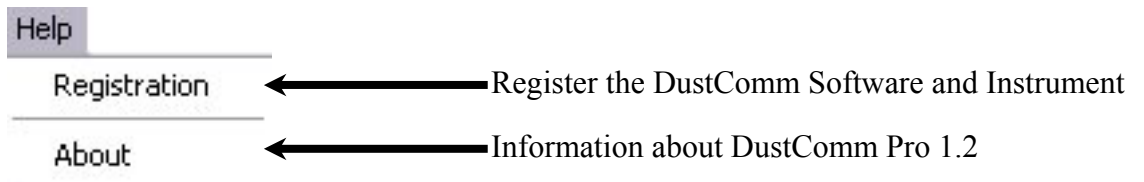


Figure 7. Help Menu Options.

File Menu Commands

Introduction Use the File Menu option to open, save, print, close and export sampled data. You can also use the File Menu to Exit the DustComm Pro Software

Notes:

- Data is sorted by time collected.
 - Data points are reported in mg/m³.
-

Opening an existing project folder

Follow the steps in the table below to retrieve stored project data.

NOTE: A sample .dcm file is preloaded for review of software options.

Step	Action
1	Select File .
2	Select Open .
3	Double click on the desired Project Folder. Note: DustComm will save all files in My Documents, or user selected folder.

Saving a project folder

Follow the steps in the table below to store project data.

Step	Action	
1	Select File .	
2	If... <ul style="list-style-type: none"> • Saving the data in the project folder for the first time, or, • Saving an existing folder to a new name or location. 	Then Select... <ol style="list-style-type: none"> 1. Save As, then, 2. Type a file name for the project file. 3. Select OK.
	Saving an updated version of an existing project folder to the same file name and location.	Save
Result: The data is saved in the new project folder and the new file name is displayed in the title bar. Only with Save As with the data have a new file name and location if selected.		

Continued on next page

File Menu Commands, Continued

Exit software Exit DustComm Pro Software in one of two ways.

Option number	Action
1	1. Select File . 2. Select Exit .
	Or
2	Single click on the “X” in the upper right hand corner of the screen.

Downloading Data

Introduction Internally stored data can be downloaded to DustComm for detailed analysis.

Downloading data The three major steps used to download data from the dust-monitoring unit to a PC are listed below and detailed in the next few pages.

1. Connect the cable.
 2. Prepare the PC for data transmission.
 3. Prepare the dust-monitoring unit for data transmission.
-

Connect the cable Follow the steps in the table below to connect the cable for data transmission.

Step	Action
1	Connect one end of the supplied RS232 cable to the dust-monitoring unit. Note: If USB compatibility needed you will need to purchase a serial to USB adapter.
2	Connect the other end of the RS232 cable to the appropriate COMM port on the PC. Note: Check that both connections are secure. An intermittent connection can disrupt data transmission.

Preparing the PC Follow the steps in the table below to prepare the PC for data transmission.

Note: Multiple locations will be separated by tabs at the bottom of the program.

Step	Action
1	Open DustComm.
2	Select Unit and Select Properties .
3	Under the Properties selection choose your unit and the Com Port that you want to connect. Press Ok when you are finished
4	Select Unit and Select Download .
5	When the items above are finished you should see the download box appear.

Continued on next page

Downloading Data, Continued

Preparing the unit.

Follow the steps in the table below to prepare the unit for data transmission.

Step	Action
1	Select Playback or Review Data (depending on your instrument) from the Main Menu on the unit.
2	Select Download .
3	Select To Dust Data Collector .
4	Press ENTER . Result: The Transmitting window appears. Note: Bars on the PC screen should increase as the unit downloads.
5	When the transmission is complete... <ul style="list-style-type: none"> • The To Dust Data Collector selection screen is displayed on the units monitor. The unit may be shut off at this time. • The downloaded data is displayed in the Project Folder on the PC. (Figure 8).

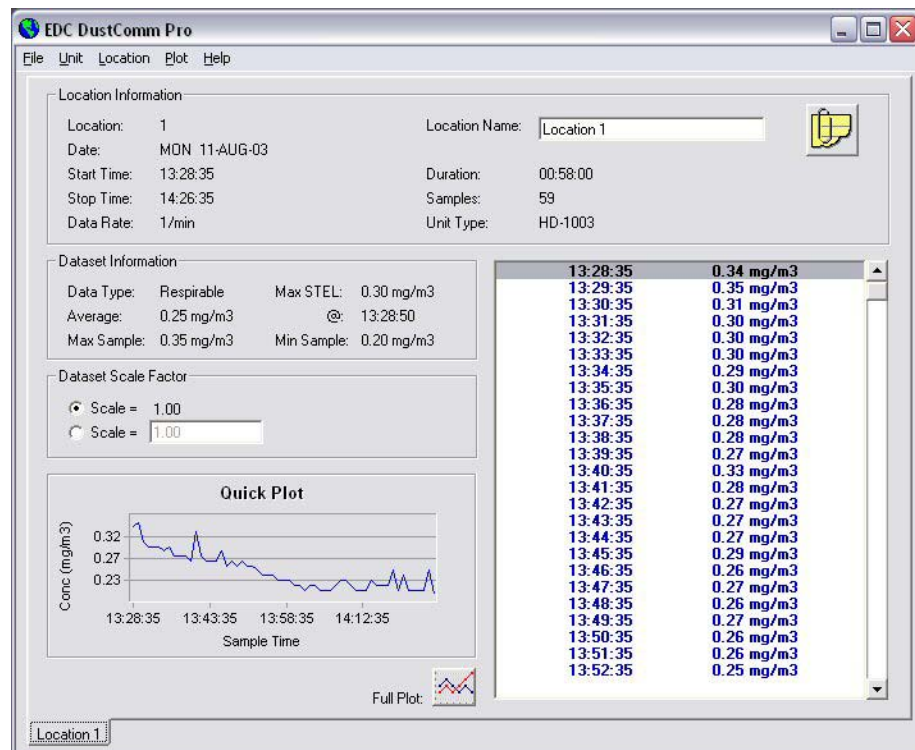


Figure 8. Project File after data has been transmitted.

DustComm Pro Window

Introduction Each section of the DustComm Pro Window will explain a different part of the statistics.

Location Information	The Location information will give you general details about the downloading statistics. Such as date, time, start/stop time, data rate, duration, how many samples where downloaded and the unit. There is also box so that you can name the location and a shortcut to type in any notes you would like to add.
-----------------------------	---

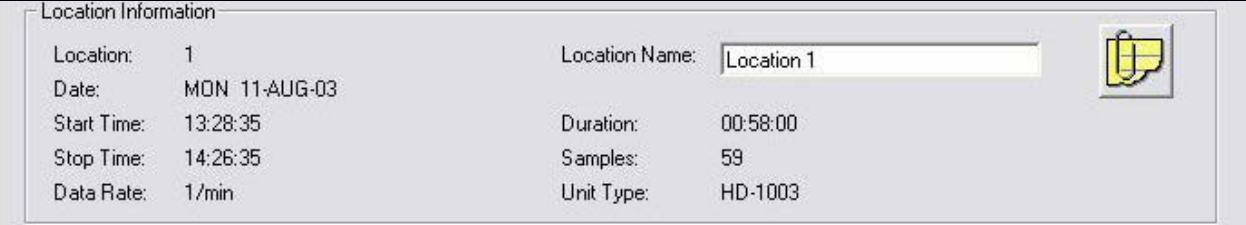


Figure 9. Location Information section of the DustComm Pro Window.

Dataset Information	The Dataset Information will tell you more specific information about the downloaded statistics. Such as type of data, the average, the Max/Min Sample and the Max STEL.
----------------------------	--



Figure 10. Dataset Information section of the DustComm Pro Window.

Continued on the next page

DustComm Pro Window, Continued

Dataset Scale Factor	The dataset scale factor section of the DustComm Pro Window, is so that you can adjust the scale to be equal to your specific type of dust. You can read more about adjusting the scale factor on page15.
-----------------------------	---

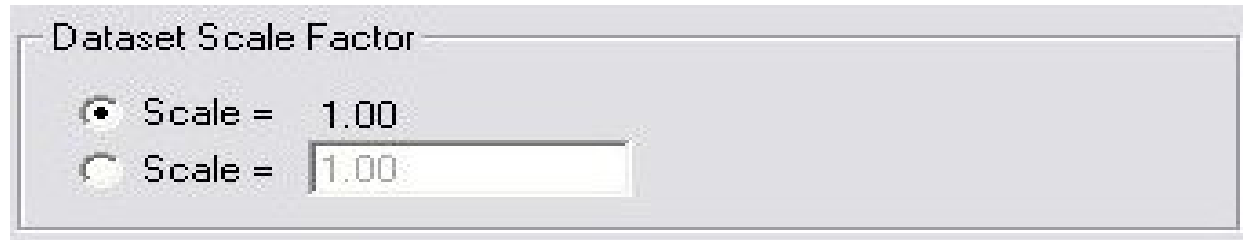


Figure 11. Dataset scale factor section of the DustComm Pro Window.

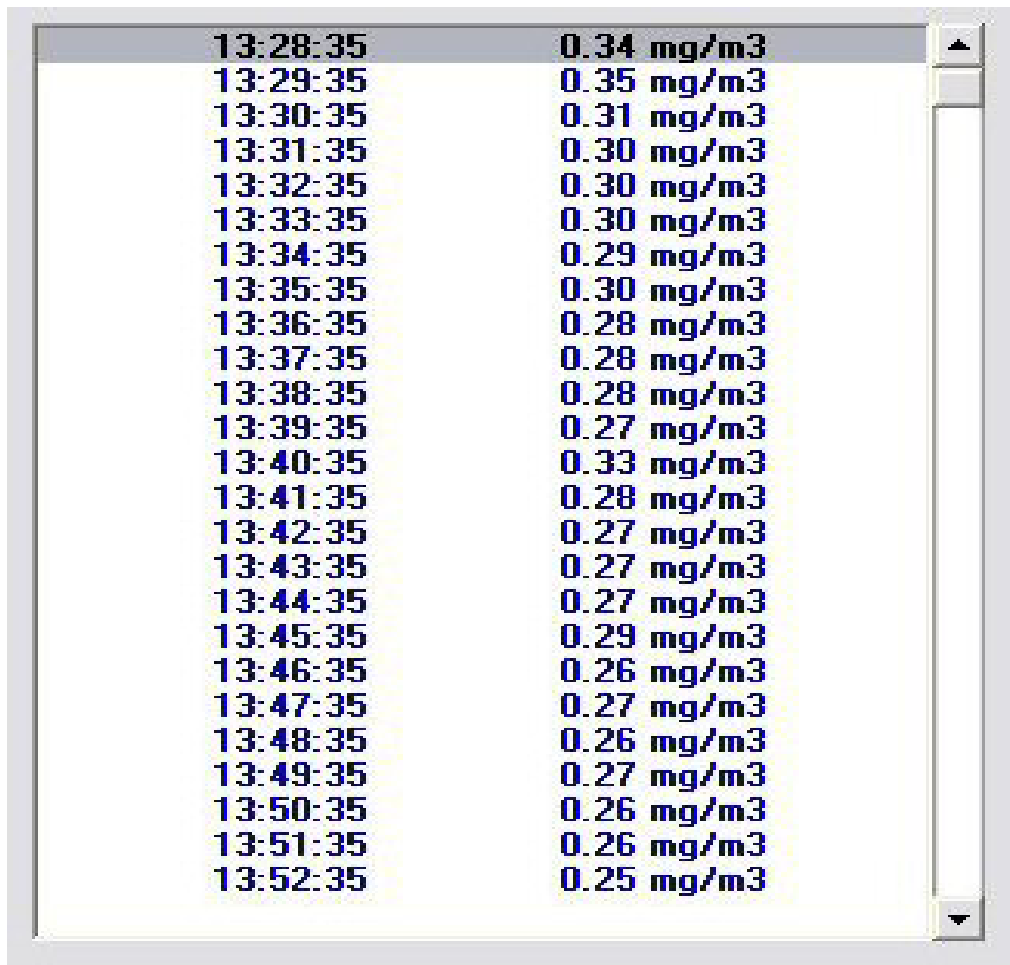
Quick Plot	The Quick Plot graph shows you a miniature version of the Full Plot. The Full Plot button is located directly below Quick Plot can you can read more about Full Plot on pages11-14.
-------------------	---



Figure 12. Quick Plot & Full Plot Button on the DustComm Pro Window.

DustComm Pro Window, Continued

Location Data	The location data section shows you the milligrams per cubic meter you sampled for and the times that they were sampled at.
----------------------	---



13:28:35	0.34 mg/m3
13:29:35	0.35 mg/m3
13:30:35	0.31 mg/m3
13:31:35	0.30 mg/m3
13:32:35	0.30 mg/m3
13:33:35	0.30 mg/m3
13:34:35	0.29 mg/m3
13:35:35	0.30 mg/m3
13:36:35	0.28 mg/m3
13:37:35	0.28 mg/m3
13:38:35	0.28 mg/m3
13:39:35	0.27 mg/m3
13:40:35	0.33 mg/m3
13:41:35	0.28 mg/m3
13:42:35	0.27 mg/m3
13:43:35	0.27 mg/m3
13:44:35	0.27 mg/m3
13:45:35	0.29 mg/m3
13:46:35	0.26 mg/m3
13:47:35	0.27 mg/m3
13:48:35	0.26 mg/m3
13:49:35	0.27 mg/m3
13:50:35	0.26 mg/m3
13:51:35	0.26 mg/m3
13:52:35	0.25 mg/m3

Figure 13. Location Data on the DustComm Pro Window.

Translating Data to an ASCII Text File

Introduction

Project Data must be translated into ASCII text format before it can be read by a spreadsheet application.

Translating data

Follow the steps in the table below to Translate Project Data into ASCII Text format.

Note: A Project Folder must be open to access the translate feature.

Step	Action
1	Select File from the Main Menu.
2	Select Export.
3	An “Export Locations” Window will appear. Select either All for all locations or select the range of locations you would like to export. Click OK when you have selected your locations.
4	An “Export To...” Window will appear. Type in the name that you would like to call your exported data and click Save .
6	When you are ready to open the data in a spreadsheet application. Open the spreadsheet program go to the Open menu, select all files under type of file name and double click on the file you want to review. This will result in your saved data opening in your spreadsheet program.

Location Number:		
A	B	C
1	Location N	1
2	Location N	Location 1
3	Date:	MON 11-AUG-03
4	Start:	13:28:35
5	End:	14:26:35
6	Data Type:	Respirable
7	Unit Type:	HD-1003
8	Data Scale:	1
9		
10	13:28:35	0.34 mg/m3
11	13:29:35	0.35 mg/m3
12	13:30:35	0.31 mg/m3
13	13:31:35	0.3 mg/m3
14	13:32:35	0.3 mg/m3
15	13:33:35	0.3 mg/m3
16	13:34:35	0.29 mg/m3
17	13:35:35	0.3 mg/m3
18	13:36:35	0.28 mg/m3
19	13:37:35	0.28 mg/m3
20	13:38:35	0.28 mg/m3
21	13:39:35	0.27 mg/m3
22	13:40:35	0.33 mg/m3
23	13:41:35	0.28 mg/m3
24	13:42:35	0.27 mg/m3
25	13:43:35	0.27 mg/m3
26	13:44:35	0.27 mg/m3
27	13:45:35	0.29 mg/m3
28	13:46:35	0.26 mg/m3
29	13:47:35	0.27 mg/m3
30	13:48:35	0.26 mg/m3
31	13:49:35	0.27 mg/m3
32	13:50:35	0.26 mg/m3

Figure 14. Exported Excel information.

Generating a Plot

Introduction A graph can be plotted with full plot located at the bottom of the DustComm Pro Window.

Generating a graph Follow the steps in the table below to generate a graph using the DustComm Plot menu selections.

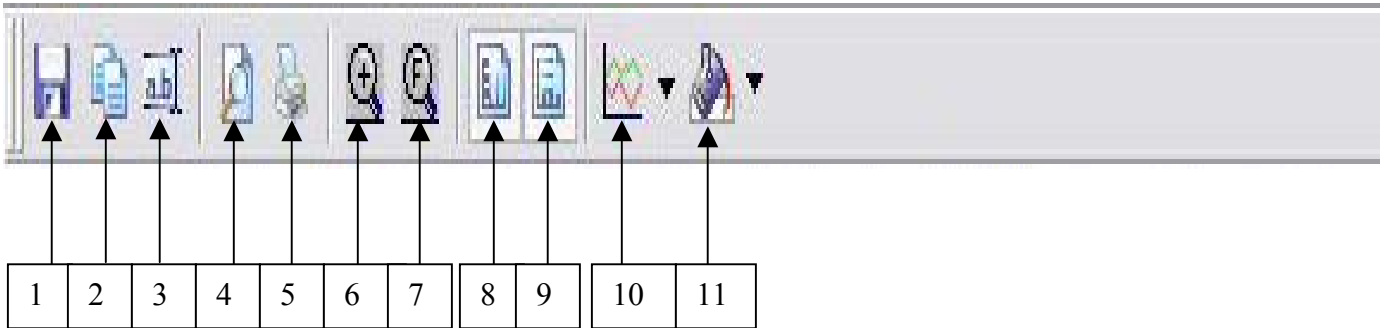
Step	Action
1	Select Plot .
2	Select Review . This option is for graphs that have already been saved. Note: For new statistics click on the “Full Plot” Icon on the DustComm Pro Window.
3	The result is graph will be plotted to the screen (see figure 15 below).



Continued on next page

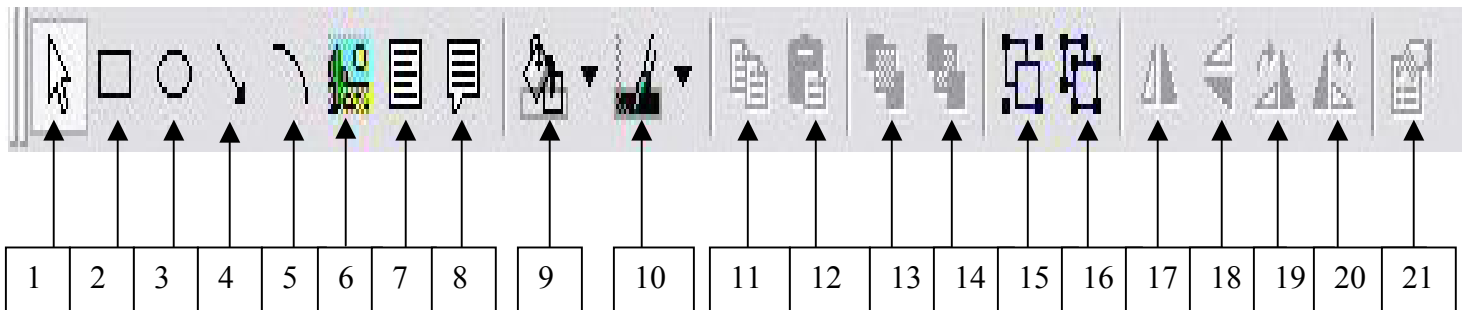
Data Plot Menu Selections

Introduction At the top of the data plot will be a button bar. Below is an explanation of what each button does.



Number	Function
1	Saves plotted information as a DustComm Pro Chart (*.dcc).
2	Copies plot to a bitmap file.
3	Edits the title of the plot.
4	Page Setup Properties.
5	Prints the current plot.
6	Zooms into plot. By Highlighting from point to point that you want zoomed in on.
7	Returns to full screen of plot.
8	Adds or removes vertical lines.
9	Adds or removes horizontal lines.
10	Select the specific type of graph, i.e. bar or line graphs.
11	Changes color of the graph.

Data Plot Menu Selections, Continued



<i>Number</i>	<i>Function</i>
1	Pointer tool.
2	Insert Squares.
3	Insert Ovals.
4	Insert arrows.
5	Insert arched lines.
6	Insert a picture. Choose the size of your picture and then right click on the box and select properties. Select the picture tab and select picture. The picture you chose will appear in the box.
7	Insert a text box.
8	Insert a callouts with text.
9	Change the color of your squares, ovals, text boxes and callouts.
10	Change the color of the text in your text boxes and callouts.
11	Copy squares, ovals, text boxes and callouts.
12	Paste squares, ovals, text boxes and callouts.
13	Bring squares, ovals, text boxes and callouts to front.
14	Send squares, ovals, text boxes and callouts to the back.
15	Group squares, ovals, text boxes and callouts.
16	Ungroup squares, ovals, text boxes and callouts.
17	Flip over left to right squares, ovals, text boxes and callouts.
18	Flip over up and down squares, ovals, text boxes and callouts.
19	Rotate squares, ovals, text boxes and callouts clockwise.
20	Rotate squares, ovals, text boxes and callouts counterclockwise.
21	Properties of selected squares, ovals, text boxes and callouts.

Editing Title

Introduction A customized title can be added to a graph before printing.

Editing the title Follow the steps in the table below to add a title to the graph.

Step	Action
1	Have location plotted already.
2	Select the Edit Title button on the menu bar.
3	A Window will appear where you can edit the title for what you would like its name to be.
4	Select OK when the correct title is in the box. Result: The graph will be created with the new caption.



Figure 16. Edit Title Window.

Applying a Correction Factor

Introduction

A correction factor can be applied to the data collected with the unit to account for variances in gravimetric readings.

Calculating a correction factor

The correction factor is calculated by dividing the Gravimetric reading by the unit reading.

Applying a correction factor

Follow the steps in the table below to apply a correction factor to all data points in the current project folder.

Step	Action
1	Select the 2 nd Scale= with a box where you can type in your scale factor.
2	Type in the Scale factor.
3	After the scale factor is entered press enter. <u>Result:</u> All data points in the project folder have been multiplied by the correction factor.

Removing the correction factor

Follow the steps in the table below to remove the correction factor from the data points in the project folder.

Step	Action
1	Select the 1 st Scale= under the Dataset Scale Factor . <u>Result:</u> Data points should return to original state.

Inability to Download Data to PC

Introduction

If DustComm Software installs properly but downloading instrument to computer is unsuccessful try the following:

- **Ensure that the RS232 cable connectors from the PC are *tightly screwed* into place.**
- **Ensure that the communications settings are set appropriately in the Download Properties screen of the DustComm program. Select Unit, Properties to access this dialog box. The communications port must be set to the appropriate Com Port used on the PC.**
- **If you are experiencing problems downloading your unit's results to your PC, and the RS232 cable connectors are secured tightly, your cable may be connected to the wrong 9-pin port on your PC. If your PC has more than one 9-pin connection port, attach the cable to another 9-pin port and try to download the dust monitor's results at that port. You may need to try all of your PC's 9-pin ports before finding the correct connection.**
- **If the previous steps check out, try using the Windows supplied HyperTerminal or other appropriately configured communications software to receive data when downloading from the SKC EPAM-5000 Monitor.**
- **If using a USB port make sure you are using the proper USB to serial adapter.**

For service or Technical Questions please call 800-234-2589 or e-mail techsupport@hazdust.com

Chapter 5 - Maintenance

Chapter 5

Maintenance

Chapter Overview

Introduction This chapter covers the routine maintenance procedures for the SKC EPAM-5000.

In this chapter This chapter contains the following topics.

Topic	See Page
Checking the Calibration Span. (Optional Accessory).	5-2
Checking the Flow Rate.	5-5
Adjusting the Flow Rate.	5-7
Battery Maintenance.	5-8
Cleaning the Impactors	5-11
Cleaning the Sensor Optics.	5-12

Checking the Calibration Span

Introduction The Span Reference Insert Part Number CS-105 is a light scattering device that provides a constant value (termed a “k” factor).

The Span Reference should be used as a reference to check factory calibration of the EPAM-5000 Monitor.

When to check the calibration span The calibration span should be checked under the following conditions:

- Once a month with normal usage. (Normal use is twice a week).
- If the EPAM-5000 is dropped or otherwise damaged.
- The first time you use the unit to double check the factory calibration.

Note: The EPAM-5000 can be sent to SKC. Annually recalibration recommended in accordance with ISO and NIST procedures.

Conditions The following conditions must be met before checking the calibration span.

Condition...	For further information see page...
The Sensor Optics must be clean.	5-11
The Environment must be clean.	---
The Battery must be fully charged.	5-7



Figure 5-1. Inserting CS-105 into SKC EPAM-5000 Sensor.

Continued on next page

Checking the Calibration Span, Continued

Checking Calibration Span

Follow the steps in the table below to check the Span of the EPAM-5000 Monitor.

Note: Failure to follow this procedure in its entirety may cause an incorrect “k” value reading.

Step	Action								
1	Turn monitor on.								
2	Run monitor on a 1 (one) second sample rate for (5) minutes. See Chapter 3 Page 3-9 Sampling.								
3	With unit running select down arrow from keypad to activate Auto Purge. An “X” will appear in the upper right hand corner to indicate sensor is purging. See Chapter 3 Page 3-6 Auto Zero Purge if more detailed information is needed.								
4	After Auto Purge is complete (x is no longer present on screen) select enter to stop monitor from running.								
5	Performing the Span Check.								
	<table border="1"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>5-1</td> <td>Select Span Check from Main Menu.</td> </tr> <tr> <td>5-2</td> <td>Select Yes to proceed with span check (all data will be lost) or select no if you want to download stored data.</td> </tr> <tr> <td>5-3</td> <td>After selecting yes calibrate sensor will appear. Scale factor must reset to 1000. If not press up or down arrow as needed.</td> </tr> </tbody> </table>	Step	Action	5-1	Select Span Check from Main Menu.	5-2	Select Yes to proceed with span check (all data will be lost) or select no if you want to download stored data.	5-3	After selecting yes calibrate sensor will appear. Scale factor must reset to 1000. If not press up or down arrow as needed.
Step	Action								
5-1	Select Span Check from Main Menu.								
5-2	Select Yes to proceed with span check (all data will be lost) or select no if you want to download stored data.								
5-3	After selecting yes calibrate sensor will appear. Scale factor must reset to 1000. If not press up or down arrow as needed.								
6	Remove Auto Zero filter and impactor sleeve.								
7	Insert the span reference into the sensor head (see diagram 5.1 on page 5-2). Allow 2-3 minutes for reading to stabilize. Note: Be sure the locating pin on the calibration reference slides into the locating hole on the sensor head. Also Push down on the calibration reference to be sure it is aligned properly. Slightly twist CS-105 clockwise when positioned in alignment hole. This will ensure the CS-105 is in the exact position and ensure reproducibility when “K” value is displayed on the EPAM-5000 monitor.								
8	Observe the printed “k” value on the calibration reference. Note: The printed “k” value should match the concentration value shown on the EPAM-5000 LCD to within $\pm 10\%$.								

Continued on next page

Checking the Calibration Span, Continued

	IF	THEN
9	The numbers agree within $\pm 10\%$	The EPAM-5000 has passed the span check test.
	The two numbers do not agree within $\pm 10\%$.	<ol style="list-style-type: none"> 1. Repeat the process to rule out error, then 2. Call or e-mail EDC technical support or return the EPAM-5000 for recalibration.
	Remove Span Reference and place in its protective sleeve.	
<p>Note: Optical windows on CS-105 can not have fingerprints or contamination, please clean using KK-101 Cleaning Kit.</p>		

Note: If the CS-105 is purchased from as an after market accessory, the end user must assign “k” value. To assign “k” value repeat steps 1-7 and step 9 three times. Take an average of the three numbers you recorded to get your “k” value.

Checking the Flow Rate

Introduction

It is good technique to check the flow rate every time a new gravimetric filter is used for sampling.

Checking the flow rate

Use the steps in the table below to check the flow rate.

Notes:

- When using an impactor, be sure the proper sampling inlet is attached to the sensor head.

Step	Action											
1	Attach your airflow calibrator to the EPAM-5000 using the table below.											
	If sampling...	Then...										
	PM-10, PM-2.5, PM-1.0 or TSP	1. Attach one end of the calibration airflow tubing to flow adapter. 2. Connect the other end of the calibration airflow tubing to your airflow calibrator.										
2	Activate the internal sampling pump using the steps below.											
	<table border="1"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Select Special Functions from the Main Menu</td> </tr> <tr> <td>2</td> <td>Select System Options.</td> </tr> <tr> <td>3</td> <td>Select Extended Options.</td> </tr> <tr> <td>4</td> <td>Select Battery Status.</td> </tr> </tbody> </table> <p>Note: Battery Status should indicate greater than 6.1 volts for fully charged battery.</p>		Step	Action	1	Select Special Functions from the Main Menu	2	Select System Options.	3	Select Extended Options.	4	Select Battery Status.
Step	Action											
1	Select Special Functions from the Main Menu											
2	Select System Options.											
3	Select Extended Options.											
4	Select Battery Status.											
3	Observe the flow rate on your air flow calibrator.											
	If...	Then...										
	The flow rate is 4.0 LPM.	The flow rate is properly calibrated. Detach the airflow calibrator tubing and continue with the “Selecting the Particle Size” process.										
	The flow rate is not 4.0 LPM.	The flow rate must be adjusted. See page 5-7 for instructions.										
	No flow is present.	See Troubleshooting section on Chapter 6.										

Adjusting the Flow Rate

Introduction The flow rate must be adjusted when it does not equal 4.0 LPM.

Adjusting the flow rate Follow the steps in the table below to adjust the flow rate.

1	Locate the adjustment screw on the front of the EPAM-5000.						
2	Use the flow adjustment screw to adjust the flow rate.						
	<table border="1"> <thead> <tr> <th>To...</th> <th>Turn the adjustment screw...</th> </tr> </thead> <tbody> <tr> <td>Decrease the flow rate</td> <td>Counterclockwise</td> </tr> <tr> <td>Increase the flow rate</td> <td>Clockwise</td> </tr> </tbody> </table>	To...	Turn the adjustment screw...	Decrease the flow rate	Counterclockwise	Increase the flow rate	Clockwise
To...	Turn the adjustment screw...						
Decrease the flow rate	Counterclockwise						
Increase the flow rate	Clockwise						
3	Record the Flow Rate.						
4	Detach the airflow calibrator and calibration airflow tubing.						
5	Select enter to terminate battery status sensor and return to main menu.						

NOTE: Flow meter must be vertical when reading measurement.

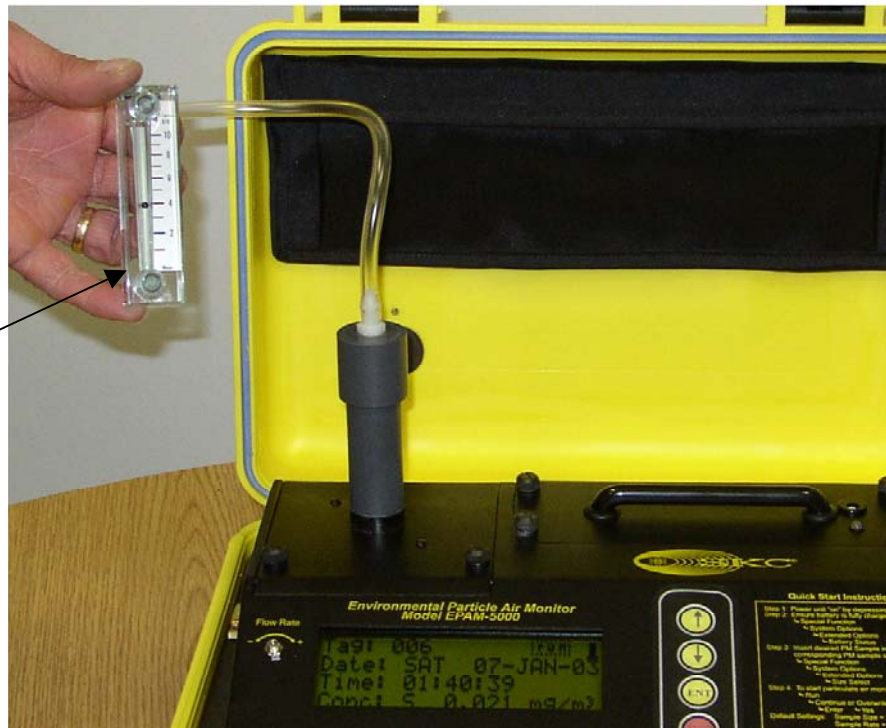


Figure 5-2. Flow Adjustment Meter attached to EPAM-5000.

Battery Maintenance

Introduction The battery pack is a 6.0-volt lead acid rechargeable battery that can hold a charge for up to 24 hours. It is important to check the battery periodically and recharge when necessary.

Checking the Battery The battery status can be checked using the menu options on the EPAM-5000. Use the following menu options to check the battery.

Step	Action						
1	Select Special Functions from the Main Menu.						
2	Select Systems Options .						
3	Select Extended Options .						
4	Select Battery Status . Result: The Battery Level Screen displays the charging level of the unit's battery in VDC.						
5	<table border="1"><thead><tr><th>If the charge level is...</th><th>Then...</th></tr></thead><tbody><tr><td>6.1 VDC or higher</td><td>The battery is fully charged.</td></tr><tr><td>Lower than 6.1 VDC</td><td>The battery must be recharged. See instructions on page 5-9.</td></tr></tbody></table>	If the charge level is...	Then...	6.1 VDC or higher	The battery is fully charged.	Lower than 6.1 VDC	The battery must be recharged. See instructions on page 5-9.
If the charge level is...	Then...						
6.1 VDC or higher	The battery is fully charged.						
Lower than 6.1 VDC	The battery must be recharged. See instructions on page 5-9.						

Continued on next page

Note: A battery status bar is displayed in the upper right hand corner when unit is in the run mode. See Figure 3.10 in Chapter 3. This is only a relative indicator of battery status. Actual voltage is displayed under battery status menu.

Battery Maintenance, Continued

Recharging the battery

Follow the steps in the table below to recharge the battery using the supplied charger.

Note: If the battery is low the sampling process will terminate and the low battery screen will display.

Step	Action
1	Plug the battery charger into an electrical outlet.
2	Plug the battery charger into the battery charge jack on the top panel of EPAM-5000 Battery. Results: <ul style="list-style-type: none">• The battery charge begins. LED indicator should be Red.• Unit must be off or the battery must be removed from instrument for LED to be Red and charge battery.• When LED is green battery is fully charged. Note: Recharging time is approximately 22 hours when the instrument is not operating, and approximately 24 hours while the monitor is sampling.

CAUTION: Do not charge in a hazardous environment. Use <i>only</i> the EDC approved charger designed for the EPAM-5000.
--

Continued on next page

Battery Maintenance, Continued

Removing and replacing the battery pack

The battery pack can be removed and replaced whenever necessary.

Note: The battery of the EPAM-5000 can be recharged outside of the instrument.

Removing the battery

Follow the steps in the table below to remove the battery pack.

Step	Action
1	Loosen the four retaining pem screws from the top plate of the EPAM-5000. NOTE: These are special inserts and the screws are attached by a spring to tighten push the screw down and turn to loosen turn the screw and it will pop on the spring DO NOT pull the screw because you will break the spring and be unable to secure your battery pack.
2	Slide the battery plate out of the unit.
3	To re-install reverse above proceeding



Figure 5-3. Diagram of battery being removed from EPAM-5000.

Continued on next page

Cleaning the Impactors

Introduction

Impactors should be disassembled and cleaned and greased at regular intervals.

Example: You should clean impactors every thirtieth sample or once a month to start, but heavy loadings are observed on the target disk, as often as appropriate.

Cleaning the Impactors

Follow the Steps in the table below to clean the impactors.

Step	Action
1	Pushing with a pen from bottom remove the impactor through top of impactor sleeve into the palm of your free hand.
2	Rinse the impactor from top to bottom with a solvent (hexane, white gas, lantern gas) using a squeeze bottle, paying particular attention to the impaction target disks. An acceptable alternative method of cleaning involves the use of an ultrasonic bath with mild soapy water solution. Note: The impaction cup should be removed prior to re-greasing. This is accomplished by pulling the impaction cup apart from the impactor jet gently.
3	Let all parts of the impactor air-dry.
4	Prepare a mixture of solvent and impactor grease (Apiezon® M, Glisseal® Ht) or similar grease in a dropper bottle until thoroughly mixed and of a fluid consistency. Use a 1-inch length of grease to 30ml of solvent. Vigorously shake the mixture until an opaque, uniform suspension, free from grease globs, is obtained.
5	Put two or three drops of the solution on the impaction cup. The drops should saturate the disk, flowing freely to the edge.
6	Let the impaction cup “dry” by allowing the solvent to volatilize, leaving a thin film of grease on the impaction cup.
7	Replace the impaction cup onto the impactor jet. Re-insert the impactor into the impactor sleeve.

Cleaning the Sensor Optics

Introduction Although the EPAM-5000 has an internal sensor purge it is important to keep the sensor optics of the EPAM-5000 clean to ensure the integrity of the optical sensor.

The sensor optics need to be checked every 2 months or on a weekly basis, when used in a 2 to 3 mg/m³ T.W.A. environment.

Cleaning the Sensor Optics Follow the steps in the table below to clean the sensor optics.



Figure 5-4. Picture of the cleaning kit.

Continued on next page

Cleaning the Sensor Optics, Continued

Step	Action
1	Remove the thumbscrews located on sensor cover. See Diagram 5-3.
2	Inspect internal sensor. Inspect cavities for residual dust. Use one of the following methods to clean the surface. Blow the dust away with low-pressure air or wipe with foam tipped cotton swab. See figures 5-6, and 5-7.
3	<p>Inspect the glass lens covers for dust.</p> <p>Note: Use one of the following methods to clean the glass lens.</p> <ul style="list-style-type: none"> • Blow the dust away with low pressure air, or, • Use a small amount of isopropyl alcohol and wipe with cotton swabs. <p>CAUTION: Do not spill any alcohol into the internal cavity of the EPAM-5000.</p>
4	Replace the sensor cover.
5	<p>Tighten the thumbscrews snugly into place.</p> <p>NOTE: If thumbscrews are not tighten enough the flow of the EPAM-5000 could be off.</p>

Continued on next page

Cleaning the Sensor Optics, Continued



Figure 5-5. Removing the sensor covers. One cover located in front as shown in picture, the other cover is located on the right side of sensor not shown.



Figure 5-6. Dust being removed with low pressure air.



Figure 5-7. Isopropyl alcohol being applied to cotton swab.



Figure 5-8. Sensor head being cleaned with cotton swab.

Chapter 6 - Troubleshooting

Chapter 6

Troubleshooting

Chapter Overview

Introduction This chapter provides basic troubleshooting procedures for potential operating issues.

In this chapter This chapter contains the following topics.

Topic	See Page
If Instrument Does not Respond	6-2
If Memory Full Appears on Display.	6-4
Flow Rate Not Achievable	6-5
Inability to Download Data to PC.	6-6

If Instrument Does Not Respond

Introduction

Check the following items if the EPAM-5000 Monitor's LCD display is incomplete, or the display and keypad are "locked up".

Step	Action
1	If the LCD display turns on, check the battery's voltage. (Chapter 5 Section 5-8) A depleted battery will show a charge level of 5.95 VDC or lower. Replace the depleted battery with a fully charged battery (Chapter 5 Section 10) or attach the appropriate power transformer (Chapter 5 Section 9) to the EPAM-5000 Monitor.
2	If the LCD display does not appear, remove the battery (Chapter 5 Section 10) and check the voltage across positive pin and case ground using a digital voltmeter. The battery should be recharged (either inside or outside of the monitor) if it shows a charge level of 5.95 VDC or lower. Led battery indicator light should turn from red to green when battery is fully charged or after approximately 15 hours of charging. If the battery voltage is higher than 5.95 VDC, check the continuity of the 2-amp fuse in the battery pack at location F1. If the fuse is blown, replace it with a new 2-amp replacement fuse. If you do not purchase your replacement fuse from EDC, be sure to replace this fuse with an identically rated component to avoid damaging the monitor.
3	If the unit is "locked up" and the buttons on the keypad are non-functional remove the battery (Chapter 5 Section 10). Other symptoms of instrument lock up includes: Letters scrolling across the bottom of the display or non-sensible lettering, display "locked up" on preparing compensation or two lines across display. First remove the battery and charge as stated in step 2. Then replace the battery and check battery status, if it does not appear, it may be necessary to reset the instrument. A reset switch is located inside the instrument (NOTE: only use press the reset button as a last resort, all logged data can be lost). Lift the sensor cover, inside of the instrument is a push switch located on the PCB (see figure 6-2). Press reset switch for one second and release. If unit resets it self check battery status and date and time. If not, then press the switch and hold down as the pump and solenoid purges. (This should take 30 seconds to 1 minute). Once purge is complete the switch can be released, remove battery. Replace battery and check battery status (see chapter 5 section 8). If battery status does not appear repeat procedure. After battery status appears it is necessary to reset date and time (see Chapter 2 section 4) for the instrument to work. Note: Always choose over write when beginning a sampling session.

If Instrument Does Not Respond, *continued*



Lift the sensor to reach the reset switch.

Reset Switch
push in to reset.

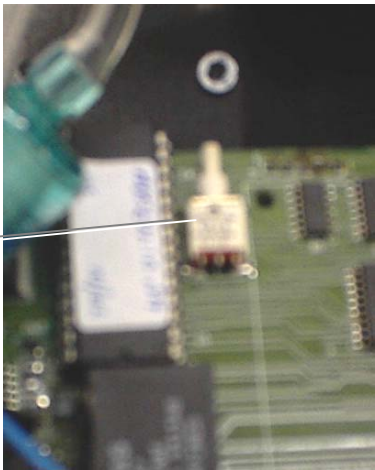


Figure 6-2: Reset switch

If Memory Full Appears on Display

Step	Action
1	<ul style="list-style-type: none"><li>• Clear the memory as described in Chapter 2 page 2-6.<li>• Lithium battery may have to be replaced. Please consult EDC certified technicians.<li>• Batteries are covered 90 days under warranty.

Flow Rate Not Achievable

Perform the following checks if the flow rate of 4 LPM is not attainable.

- Air flow meter must be vertical to ensure accurate measurements.
 - Air intake tubing is attached to filter cassette.
 - Air may be leaking from the sensor covers on the front and right side of optical sensor of the monitor. This can be tested quickly by operating the unit (Chapter 3 page 3 -9) and placing your palm or thumb over the inlet where the sample stream enters the unit. If this does not result in a noticeable strain on the pump, it is likely that leaks exist around the sensor covers or cassette holder. Remove the sensor covers and ensure the proper cover placement front cover must be placed on front of sensor this cover can be identified by the circular pattern on the gasket material of the cover itself and reinstall them tightly. Cassette holder must have the white filter holder ring installed and holder must be screwed on tightly to avoid air leaks.
-

Inability to Download Data to PC

If instrument will not download to PC.

If DustComm Pro Software installs properly but downloading instrument to computer is unsuccessful try the following:

- Ensure that the RS232 cable connectors from the monitor and PC are securely in place.
- Ensure that the communications settings are set appropriately in the Communications Setup screen of the DustComm Pro program. The communications port must be set to the appropriate COM port connector used on the PC.
- If you are experiencing problems downloading your monitor's results to your PC, and the RS232 cable connectors are secured tightly, your cable may be connected to the wrong 9-pin port on your PC. If your PC has more than one 9-pin connection port, attach the cable to another 9-pin port and try to download the monitor's results at that port. Some PCs can have up to eight 9-pin ports. You may need to try all of your PC's 9-pin ports before finding the correct connection.
- If the previous steps check out, try using the Windows -supplied HyperTerminal or other appropriately configured communications software to receive data when downloading from the EPAM-5000 Monitor.

If software does not install properly:

- Ensure DustComm Pro Software is being installed on the C: Drive EPAM5000 Subdirectory.

For service or Technical Questions please call 603-378-2112 or e-mail techsupport@hazdust.com

Appendix

Appendix A

Menu Screens

Introduction

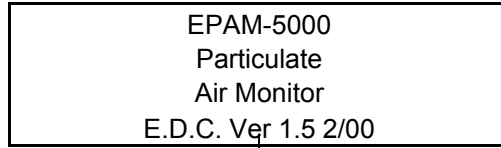
This Appendix contains a complete overview of the Menu Screens for the EPAM-5000.

The following pages show diagrams of the Main Menu Screens, the Run Screens, the Review Data Screens, and the Special Functions Screens.

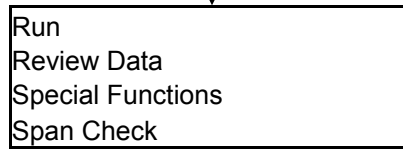
Note: Selecting **CANCEL** from any Menu Screen will back out of the current function.

Appendix A

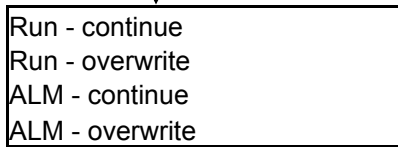
Main Screens



Title Screen



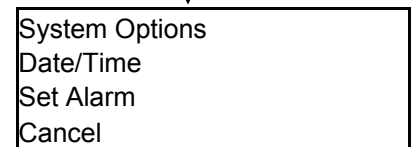
Main Menu



Run



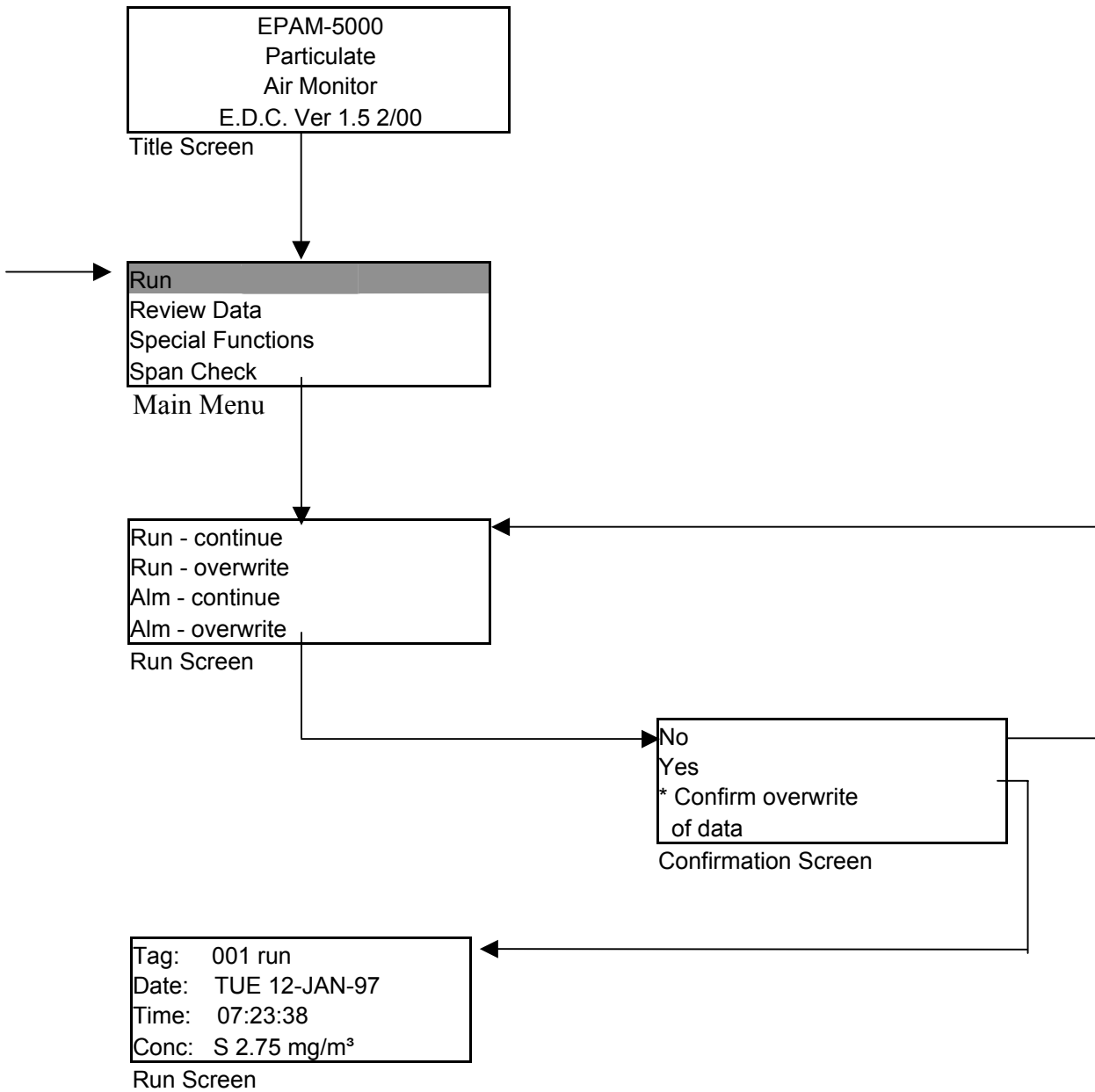
Playback



Special Functions

Appendix A

Sample/Record Screens



Appendix A

Playback Screens

EPAM-5000
Particulate
Air Monitor
E.D.C. Ver 1.5 2/00

Title Screen



Run
Review Data
Special Functions
Span Check

Main Menu



Statistics
Download
Cancel

Review Data Screen



Scanning
memory

Scanning Memory Screen



Tag: 002 *STATS*
Date: Tues 26-JAN-97
Start: 08:55:21
Stop: 09:31:55

Stats Screen 1



**** MAXIMUM ****
Date: TUE 26-JAN-97
Time: 08:55:21
Conc: s 0.17 mg/m³

Stats Screen 2



**** MINIMUM ****
Date: TUE 26-JAN-97
Time: 08:55:21
Conc: s 0.0 mg/m³

Stats Screen 3



**** T.W.A. ****
Date: TUE 26-JAN-97
T.W.A.: 0.08mg/m³
Elapsed:0:00:32

Stats Screen 4

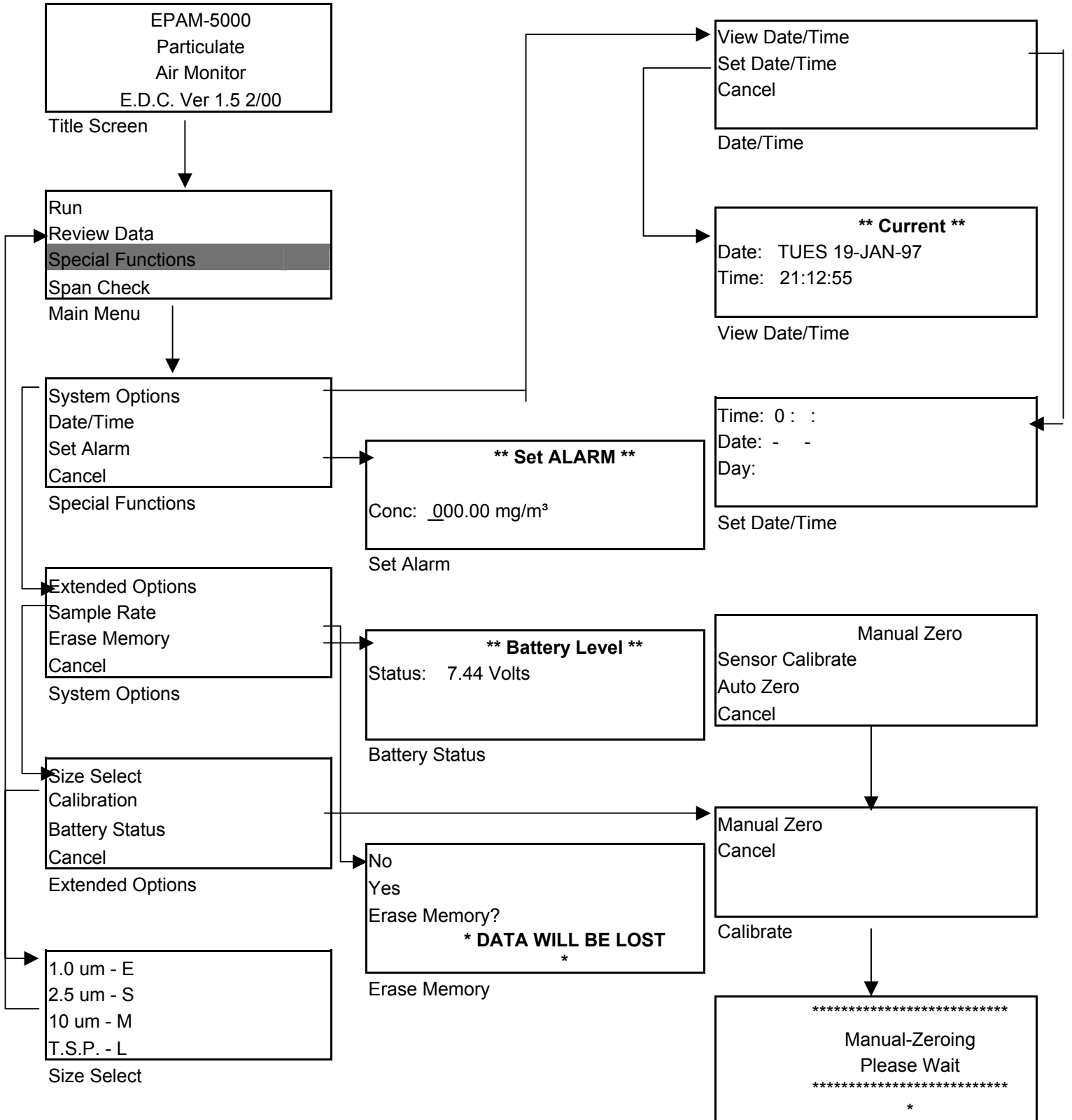


**** S.T.E.L. ****
Date: TUE 26-JAN-97
STEL: 0.432 mg/m³
Time: 14:23:28

Stats Screen 5

Appendix A

Special Functions Screens



Appendix B

NIOSH/OSHA Particulate Air Monitoring Reference

Dust/Hazard	Agency	Reference	TWA	STEL
alpha-Alumina (Respirable fraction)	OSHA	CIM	5 mg/m ³	
alpha-Alumina (Total dust)	OSHA	CIM	15 mg/m ³	
Aluminum, Pyro powders	OSHA	CIM	*	
Aluminum (Respirable fraction)			5 mg/m ³	
Ammonium nitrate	OSHA	CIM	*	
Ammonium sulfamate (Respirable dust)	OSHA	CIM	5 mg/m ³	
Ammonium sulfamate (Total dust)	OSHA	CIM	15 mg/m ³	
Ammonium sulfamate (Total dust)	OSHA	ID 188	15 mg/m ³	
Bismuth telluride, Se-Doped	OSHA	ID 121	5 mg/m ³	
Bismuth telluride, Undoped (Respirable dust)	OSHA	ID 121	5 mg/m ³	
Bismuth telluride, Undoped (Total dust)	OSHA	CIM	15 mg/m ³	
Boron oxide (Total dust)	OSHA	ID 125G	15 mg/m ³	
Boron oxide (Total dust) (Particulates, Total)	NIOSH	0500	10 mg/m ³	
Carbon black	NIOSH	5000	3.5 mg/m ³	
Carbon black	OSHA	ID 196	3.5 mg/m ³	
Chromium, Metal & Insol cpds	OSHA	ID 121	1 mg/m ³	
Chromium, Metal & Insol cpds	OSHA	ID 125	1 mg/m ³	
Chrysene	OSHA	58	0.2 mg/m ³	
Coal dust (<than 5% SiO ₂)	OSHA	CIM	2.4 mg/m ³	
Coal dust (>than 5% SiO ₂)	OSHA	ID 142	10 mg/m ³	
Coal tar pitch volatiles	OSHA	58	0.2 mg/m ³	
Copper dust	NIOSH	7029	1 mg/m ³	
Copper, Dusts & Mists	OSHA	ID 125G	1 mg/m ³	
Copper, Dusts & Mists	OSHA	ID 121	1 mg/m ³	
Copper (Elements)	NIOSH	7300	1 mg/m ³	
Copper fume	NIOSH	7029	0.1 mg/m ³	
Copper fume	OSHA	ID 121	0.1 mg/m ³	
Copper fume	OSHA	ID 125G	0.1 mg/m ³	
Cotton dust (Raw)	OSHA	CIM	1 mg/m ³	

* Refer to Agency Method

Continued on next page

NIOSH/OSHA Particulate Air Monitoring Reference, Continued

Dust/Hazard	Agency	Reference	TWA	STEL
Crag herbicide (Respirable dust)	OSHA	CIM	5 mg/m ³	
Crag herbicide (Total dust)	NIOSH	5(S356)	10 mg/m ³	
Crag herbicide (Total dust)	OSHA	CIM	15 mg/m ³	
Cresol, All isomers	NIOSH	2546	10 mg/m ³	
Cresol, All isomers	OSHA	32	15 mg/m ³	
Cyanide (as Cn)	OSHA	ID 120	5 mg/m ³	
Fluorides (Aerosol & Gas)	NIOSH	7902	2.5 mg/m ³	5.0 (HF)
Glass, Fibrous dust	OSHA	CIM	*	
Glycerin mist (Particulates)	NIOSH	0600	*	
Glycerin mist (Respirable)	OSHA	CIM	5 mg/m ³	
Glycerin mist (Total dust)	OSHA	CIM	15 mg/m ³	
Grain dust (Oats, Wheat & Barely)	OSHA	CIM	10 mg/m ³	
Graphite, Synthetic (Respirable dust)	OSHA	CIM	5 mg/m ³	
Graphite, Synthetic (Total dust)	OSHA	CIM	15 mg/m ³	
Iodine (Particulates)	OSHA	ID 212	*	0.1
Kaolin (Respirable dust)	OSHA	CIM	5 mg/m ³	
Kaolin (Total dust)	OSHA	CIM	15 mg/m ³	
Lead	NIOSH	7082	<0.1 mg/m ³	
Lead	NIOSH	7105	<0.1 mg/m ³	
Lead	NIOSH	7700	<0.1 mg/m ³	
Lead (Elements)	NIOSH	7300	<0.1 mg/m ³	
Lead, Inorganic fumes & dusts (as Pb)	OSHA	ID 121	0.05 mg/m ³	
Lithium (Elements)	NIOSH	7300	*	
Lithium hydride	OSHA	CIM	25 µg/m ³	
Magnesium oxide fume (Total dust)	OSHA	ID 121	15 mg/m ³	
Manganese (Elements)	NIOSH	7300	1 mg/m ³	3 mg/m ³
Manganese fume (as Mn)	OSHA	ID 121	*	5 mg/m ³
Methoxychlor (Total Dust)	OSHA	CIM	15 mg/m ³	
Oil mist (Mineral)	OSHA	ID 128	5 mg/m ³	
Oil mist (Mineral)	OSHA	ID 178SG	5 mg/m ³	
Oil mist (Vegetable) (see Dust, Total and Respirable nuisance)				
Pentaerythritol (Total dust)	OSHA	CIM	15 mg/m ³	
Pentaerythritol (Respirable dust)	OSHA	CIM	5 mg/m ³	

Continued on next page

NIOSH/OSHA Particulate Air Monitoring Reference, Continued

Dust/Hazard	Agency	Reference	TWA	STEL
Picloram (Tordon), Respirable dust	OSHA	CIM	5 mg/m ³	
Picloram (Tordon), Total dust	OSHA	CIM	15 mg/m ³	
Plaster of Paris (see Dust, Respirable nuisance)	OSHA	CIM		
Portland cement (Respirable dust)	OSHA	ID 142	5 mg/m ³	
Portland cement (Total dust)	OSHA	ID 142	15 mg/m ³	
Respirable nuisance	OSHA	CIM	5.0 mg/m ³	
Respirable nuisance (Particulates)	NIOSH	0600	*	
Total nuisance	OSHA	CIM	15 mg/m ³	
Total nuisance (Particulates)	NIOSH	0500	10 mg/m ³	
Rouge (Respirable dust)	OSHA	CIM	5 mg/m ³	
Rouge (Total dust)	OSHA	CIM	15 mg/m ³	
Silica, Amorphous	OSHA	CIM	20 mppcf	
Silica, Crystalline tripoli, Respirable dust	OSHA	ID 142	0.05 mg/m ³	
Silicon carbide (Respirable dust)	OSHA	CIM	5 mg/m ³	
Silicon carbide (Total dust)	OSHA	CIM	15 mg/m ³	
Silicon (Respirable dust)	OSHA	CIM	5 mg/m ³	
Silicon (Total dust)	OSHA	CIM	15 mg/m ³	
Soapstone (Respirable dust)	OSHA	CIM	20 mppcf	
Soapstone (Total dust)	OSHA	CIM	6 mg/m ³	
Wood dust (except Western red cedar)	OSHA	CIM	*	
Wood dust (Western red cedar)	OSHA	CIM	2.5 mg/m ³	
Zinc bromide (see Dust, Total and Nuisance)			*	
Zinc oxide dust (see Dust, Total & Respirable)	OSHA	CIM		
Zinc oxide fume	OSHA	ID 121	5 mg/m ³	
Zinc oxide fume	OSHA	ID 125	5 mg/m ³	
Zinc oxide fume	OSHA	ID 143	5 mg/m ³	
Zinc stearate (Respirable dust)	OSHA	CIM	5 mg/m ³	
Zinc stearate (Total dust)	OSHA	ID 121	15 mg/m ³	
Zinc stearate (Total dust)	OSHA	ID 125	15 mg/m ³	
Zirconium cpds (as Zr)	OSHA	ID 121	5 mg/m ³	

Appendix C

Glossary of Terms

Term	Definition/Standard
µm	Micron, 1/1000 of a meter.
ARD	Arizona Road Dust
Inhalable Dust Particulates	Particulates having a 50% cut point at 100µm.
LPM	Liters per minute.
mg/m ³	Milligrams per cubic meter.
NIOSH	National Institute of Occupational Safety & Health
OSHA	Occupational Safety & Health Administration.
Respirable Dust Particulates	Particulates having a 50% cut point at 3.5µm.
STEL	Short-term exposure level. Maximum dust concentration over a 15-minute period.
Thoracic Particulates	Particulates having a 50% cut point at 10µm.
TWA	Time Weighted Average. Average particulate concentration over a period of time.

Appendix D

EPAM-5000 Accessories

Overview

Introduction Accessories may be purchased separately for the EPAM-5000.

Accessory and part number Use the part number from the table below to order EPAM-5000 accessories.

Accessory	Part Number
110 V	BC-105-110
220 V	BC-105-220
47mm EPA FRM Sty b Cassette	FH-105
Battery Pack	BP-105
Span Reference	CS-105
Cleaning Kit	KK-101
Computer Interface Cable	CC-102
Flow Meter	FM-102
EPAM-5000 Media CD-Rom Includes: Computer Software and Instruction Manual	CD-105
1.0µm Particle Size Cut Point Impactor	EPAM-1.0
2.5µm Particle Size Cut Point Impactor	EPAM-2.5
10.0µm Particle Size Cut Point Impactor	EPAM-10.0
Shoulder Strap	SS-101
Impactor Sleeve	IMS-105
Strobe Light	SL-105
Solar Panel	SP-105
Subzero Heating Element	HA-105
Remote Hand-held Sampling Probe	RSP-105
