



USER'S GUIDE

HAZ-DUST SM-7204™ REAL-TIME PERSONAL SILICA MONITOR



MODEL SM-7204
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**ENVIRONMENTAL
DEVICES CORPORATION**

Our instruments detect what's in the air we breathe.

U.S.A.

SM-7204™

User's Guide



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1. Section One

Introduction to the SM-7204

Sections 1- Introduction to the SM-7204

Introduction

This section introduces and describes the SM-7204. It Explains operating principles of the SM-7204 and identifies features, specifications and components of SM-7204.

This section contains the following topics.

- Introduction to the SM-7204.....Page 10
- Real-Time Dust Monitoring Principles.....Page 11
- Overview of the SM-7204.....Page 12
- Features.....Page 14
- Specifications.....Page 16
- Components.....Page 17



Introduction to the SM-7204

Introduction

The SM-7204 is the world's first personal dust monitor to combine traditional filter techniques with real-time monitoring methods. These techniques combine to overcome limitations of all other dust monitoring products.

Dust Monitoring Methods

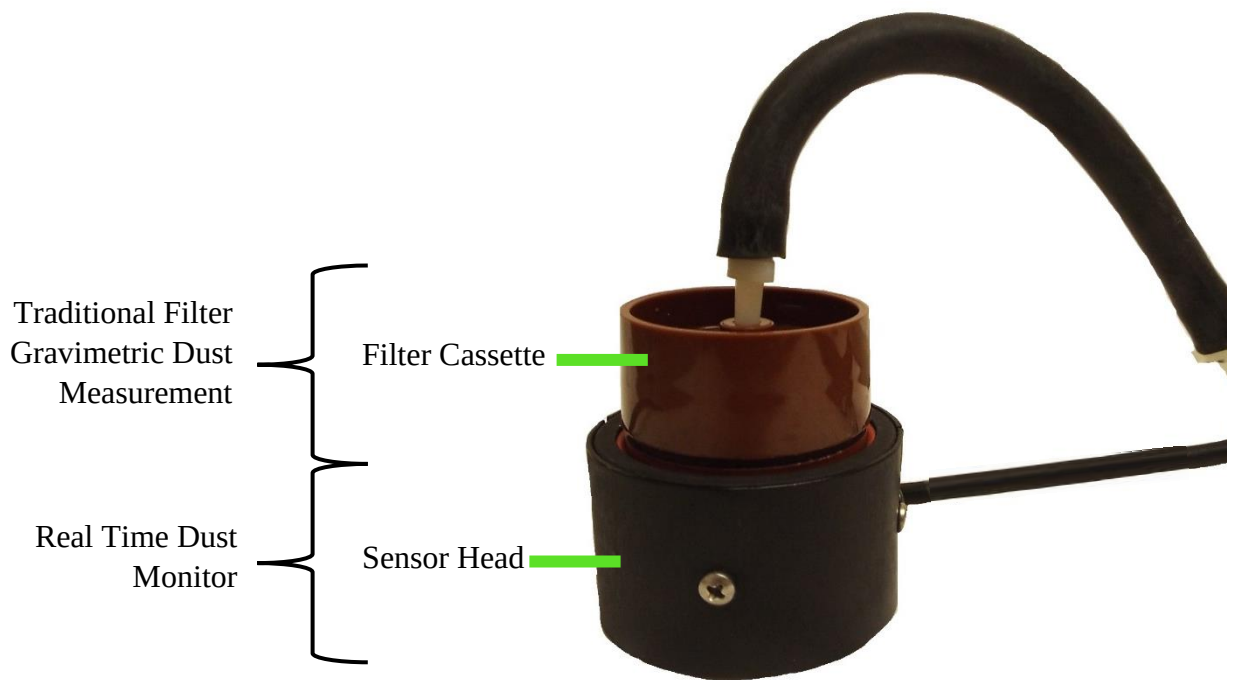


Figure 1-1. Diagram showing components used for both the traditional and real-time dust monitoring methods.

Real Time Dust Monitoring Principles

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

Description of traditional method

Air is drawn by a vacuum pump through a 25mm or 37mm diameter membrane filter. The fibers and particles collected on the membrane filter must be counted or weighed in a laboratory for further analysis.

Advantages of traditional method

- 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 SM-7204's touch screen display. All data points are stored in memory for later analysis.

Advantages of real-time method

- 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 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.

Overview of the SM-7204

Ease of use

- The user controls all functionality and programming using menus displayed on color touch screen.
- The compact unit clips to the workers belt or pocket allowing for flexibility during on-site monitoring.
- A detached sensor head easily attaches to the worker for true OSHA defined breathing zone measurements.

User adjustable alarms can be preset to alert the worker of approaching threshold limits.

General Information

- The touch screen displays real-time concentration in milligram per cubic meter (mg/m^3 or ug/m^3) in accordance with OSHA Reference Methods.
- Statistical information of TWA, STEL, Max and Min levels can be viewed instantly.
- The SM-7204 is calibrated using ISO 12103-1 Fine Test Dust (Arizona Road Dust).
- Calibrations include NIOSH 0600 methods for Respirable Dust and 0500 Method for Nuisance Dust with a $\pm 10\%$ accuracy.
- The calibration and flow of the SM-7204 can be adjusted to compensate for Thoracic, Respirable, or Inhalable changes in particle composition and distribution.

Particle Size-Selective Sampling

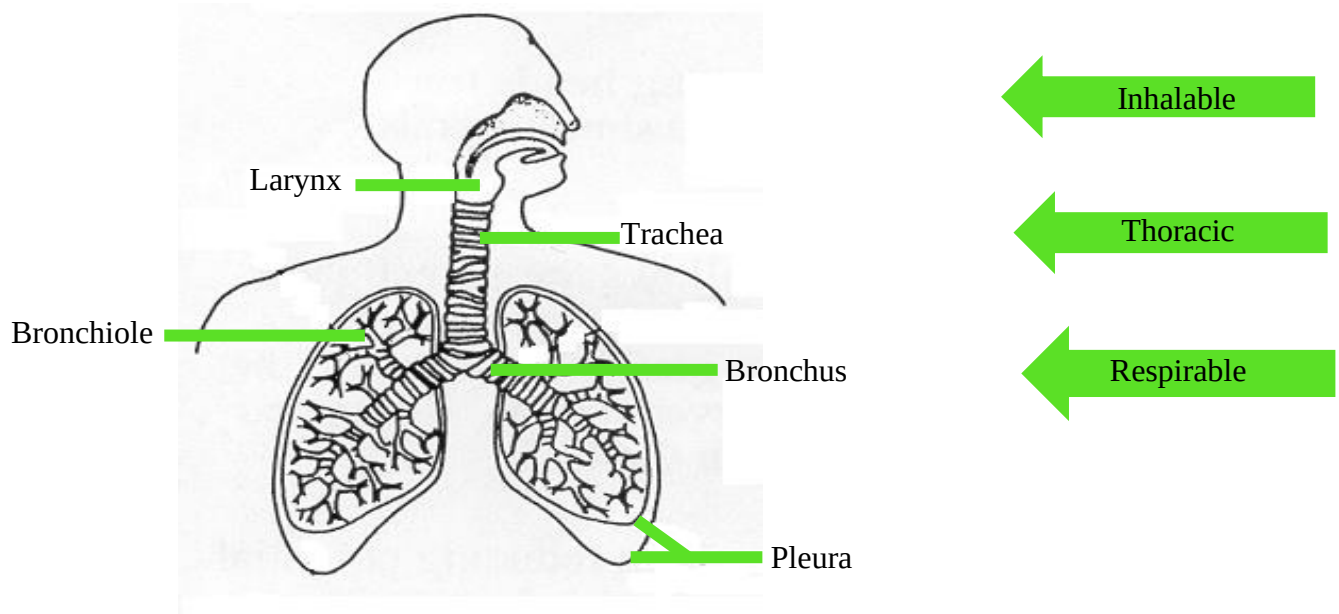


Figure 1-2. Diagram showing breathing zones of Inhalable, Thoracic, and Respirable dust particles.

DustComm Pro Software

The SM-7204 comes equipped with DustComm Pro software, which allows the user to look at real-time concentrations and graphs and internally store data to be downloaded to a PC for further analysis

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

Data can easily be exported in comma-delimited files importable into spreadsheet programs such as Microsoft Excel.

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 viewing of concentration values and real-time graphs.
- The ability to wirelessly communicate between the device and the software.

Features of the SM-7204

Introduction

The SM-7204 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
- Thoracic, Respirable or Inhalable Particulate Mass
- True breathing zone measurements
- Unique on screen programming of data sets
- Unique on Screen programming of Aerosol Profiles.
- Flow rate
- Log rate
- Graphs
- Concentration ranges
- Engineering units of measurement ug/m³ or mg/m³
- In field calibration verification

Functional features

- Calibration to NIOSH methods for lung damaging particles.
- In-line concurrent filter samples for gravimetric analysis.
- High sensitivity of 0.001-500 mg/m³ or 1-500,000 ug/m³
- Interchangeable size-selective sampling inlets.
- Internal flow compensated air sampling pump.
- Simple cleaning of sensor hardware.
- Easy user access to rechargeable battery and internal filter.

Operational features

- On-screen programming of sampling and data storage parameters.
- Ability to name data sets and dust profiles.
- Multiple date formats
- Menu options in multiple languages.
- Multiple user selectable audible alarm options
- In-field zero and span check of instrument calibration.
- Ability to Zero the instrument.
- Wireless communication.
- Ability to enter calibration factors.

Data management

- Choice of 1 second, 4 sec, 10 sec or 60 seconds averaging/storage intervals.
- Up to 15 days of stored data
- Memory storage of up to 43,000 data point or 15 days of storage.
- DustComm Pro Software supplied with a micro USB cable for downloading data to a PC. Data translation importable into Excel.

Security feature

The instrument will not power off when in active sampling mode. To power down the instrument, stop sampling and press the power off button.

Specifications of the SM-7204

Introduction

The SM-7204 meets the following specifications.

Specifications

SPECIFICATION	RANGE
Calibration	NIOSH 0600 with SAE Test Dust
Accuracy	$\pm 10\%$
Precision	0.02 mg/m ³
Sensing range	0.001-500 mg/m ³ or 1-500,000 ug/m ³
Particle size range	0.1 to 10 μm Respirable 0.1 to 50 μm Thoracic 0.1 to 100 μm Inhalable (IOM)
Recording time	1 second, 10 seconds, 30 seconds and 1 minute.
Flow rate	The pump is capable to maintain flow within $\pm 5\%$ as follows: 1.0 LPM up to 70 Inch H ₂ O 2.5 LPM up to 55 inch or H ₂ O 5.0 LPM up to 20 inch H ₂ O
Memory	43,000 data points
Output	Micro USB
Operating temperature	32 to 120° F (0° -50°C)
Humidity range	95% non-condensing
Battery	Rechargeable Lithium Ion Battery
Battery life	22 + hours
Charging time	3 hours
Size (case)	3.5" x 2.25" x 4.75"
Sensor Dimensions	1.75" x 1.5"
Weight	1.12 lbs.

Components of the SM-7204

Components

The following components ship with the SM-7204.

- SM-7204 Monitor.
- Hard Carrying Case
- Battery charger with US, UK, Asia, and European adapters
- GS-3 Cyclone for Respirable Sampling
- Detachable Thoracic sampling inlet.
- Opaque filter cassette holder.
- SM-7204 Multi Media USB Drive, Including: DustComm Pro Software and the Instruction Manual.
- Zeroing filter.
- Carrying case.
- Open faced sampling Adapter
- Calibration Certificate
- Manufactures Warranty.

2. Section Two

Operating Parameters of the SM-7204

Section 2- Operating Parameters of the SM-7204

Introduction

This section describes the steps involved in starting the SM-7204 and configuring its operating parameters.

This section contains the following topics.

- Turning the SM-7204 on and off.....Page 20
- Using the Menu.....Page 21
- Creating Unique Aerosol Profiles.....Page 23
- Cross Calibration.....Page 24
- Selecting the Language.....Page 25
- Setting the Alarm.....Page 26
- Setting the Date and Time..... Page 28
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- About Screen.....Page 34

Turning the SM-7204 ON and OFF

Introduction

The battery must be fully charged before each use. See Page 82 for information on battery maintenance.

Power-ON

1. Press the **ON/OFF** key to turn the SM-7204 monitor On. The unit will turn on and the Splash Screen will appear.



Note: Before taking a sample fully charge battery for 3 hours and allow monitor to run for at least two minutes for the SM-7204 to equilibrate and stabilize. Then perform an auto zero to set baseline. See Page 48 for detailed procedure.

Power-OFF

1. The instrument will not power off when in active sampling mode. To power down the instrument, stop sampling then press the power off button.

Using the Menu

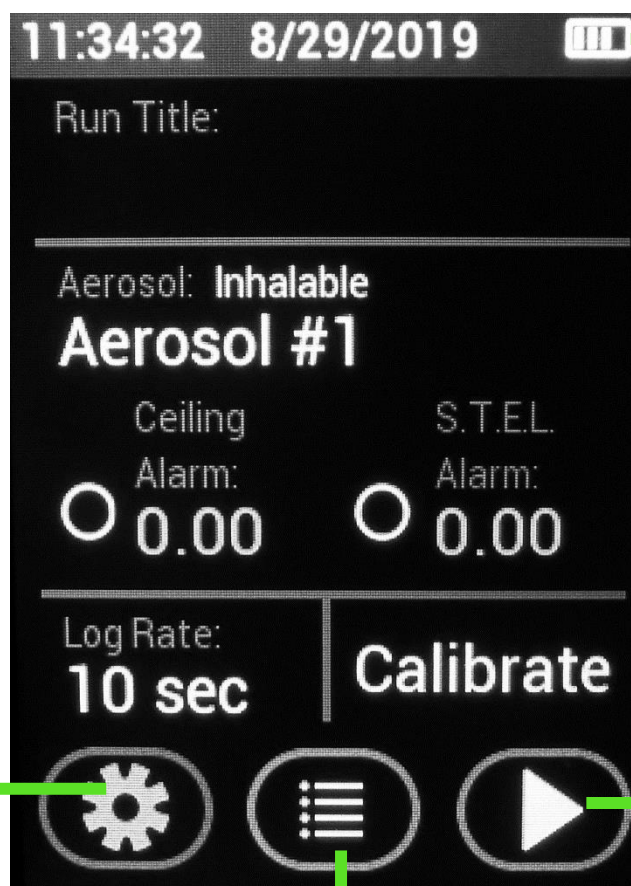
Introduction

The SM-7204 Main Menu appears on the color touch screen display once the instrument is powered on.

Note: See Appendix A for menu option flow charts.

Accessing the Main Menu

The SM-7204 is operated using the following main menu.



The “Status Bar” allows you to easily monitor the time, date, and battery life.

Pressing the “Settings” icon will display the language, data recording, data deletion, system formats, date, time, live feed, GPS, Cellular and About screens.

Pressing the “History” icon will display the last data set

Pressing the “Start” icon will activate the pump and begin the sampling. Once the button is pressed the user is brought to the real-time rolling graph screen.

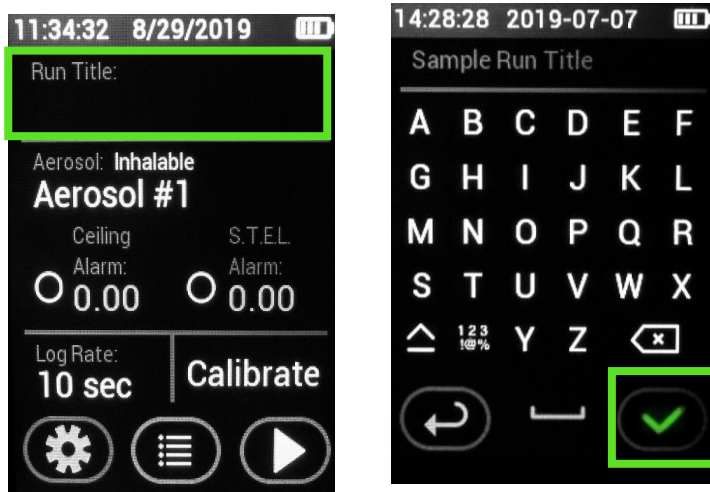


Note: Using the arrow buttons will allow the user to look at previous data sets. Pressing the back button will bring the user back the home screen.

On Screen Programming through the Main Menu

Naming Data Sets

1. Upon turning the device on for the first time, the run title will be empty. Press the Run Title to enter the name of a data set.



Note: When the device is powered off then turned back on; the last-named data set will appear as the Run Title. To access previous data sets, use the “History” button (see below).

Creating Unique Aerosol Profiles

Introduction

Pressing the Aerosol selection will allow users to create unique aerosol profiles. Each profile can contain the following entries:

Name

Particle Size

Flow

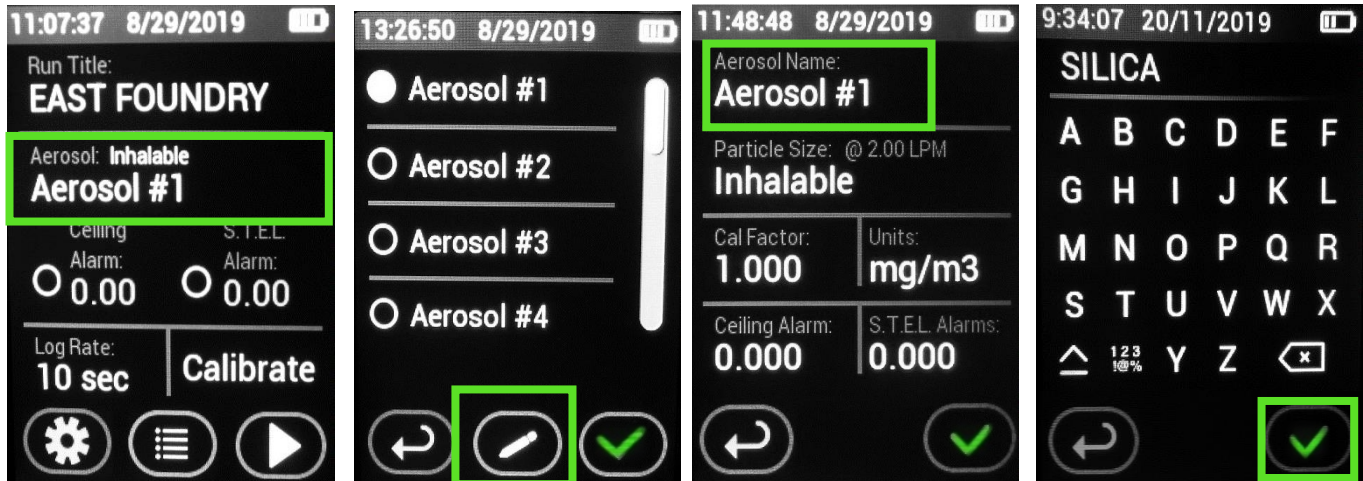
Calibration Factor

Engineering Units of Measurement

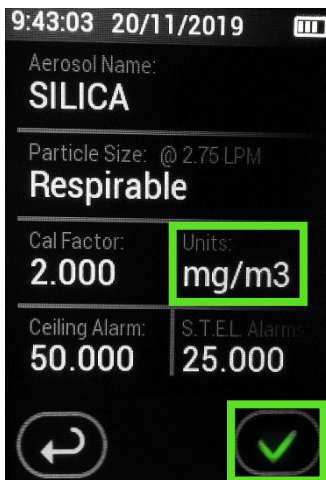
Celling Alarm

STEL Alarm.

1. After selecting the Aerosol section, Press the Pen Icon to edit the Aerosol. The factory default of the SM-7204 offers a place holder for unique Aerosol entries by listing Aerosol 1-16. Users can press the Aerosol of choice and then uniquely name each aerosol.



2. Next select the desired Units of Measurement (Either mg/m3 or ug/m3).



By pressing the “Particle Size” option users change the sampling size fraction of particulate matter and the flow rate. See more on this on pages 38 and 45

Cross Calibration

Introduction

The Aerosol entry also allows for users to enter a Cross Calibration Factor. Real Time Nephelometers are calibrated with a standardized test dust. Test dust varies; however, a commonly used test dust is the ISO12103-01A2 Fine Test Dust, or “*Arizona Road Dust*.” The particle characteristics and properties of aerosol at the application site will vary from the test dust, causing a variance in the instrumentation response. To compensate for this variance Cross Calibration or Calibration Factor is required.

$$\text{Calibration Factor} = \frac{\text{Gravimetric Filter TWA}}{\text{HD-7204 TWA}}$$

Traditional Cross Calibration requires two devices; a Reference Sampler and a Real-Time Nephelometer. The SM-7204 allows users to use one instrument as the SM-7204 offers a flow compensated pump so it becomes the reference sampler. The Reference Sampler SM-7204 is a pump offering a sensor attached to gravimetric filter. The filter is sent to the lab and compared with the post ex facto real- time readings. See example below.

Filter TWA result

SM-7204 TWA result

EXAMPLE:

Filter TWA was 5 mg/m³

SM-7204 TWA was 2.5 mg/m³

$$\frac{5}{2.5}$$

Scale factor to be entered for the next sample in the same atmosphere is 2.00



Selecting Language

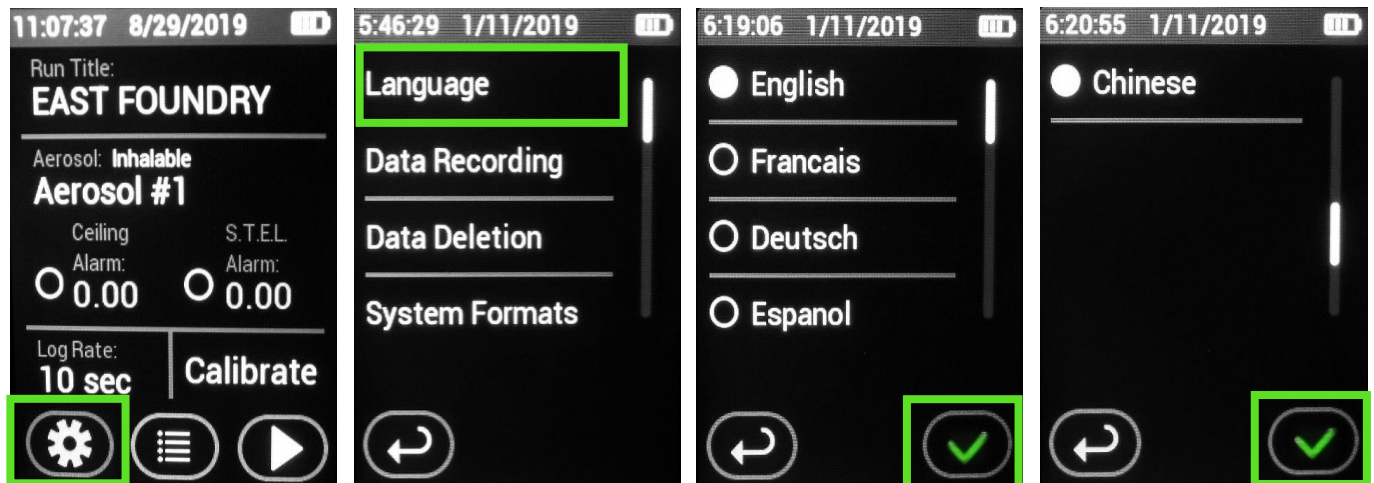
Introduction

The language is pre-set to English. It may be necessary to change the language based on the ultimate country of destination.

Selecting Language

1. From the Home Page select the “Language” Option. (The language options are: English, French, German, Spanish, and Chinese.) Press the green check mark to save or press the back button to exit without saving changes.

Note: When language is selected the following menu screens will change: Setting options, the titles on the home screen and the options on the Zero screen. The keyboard entry will always be English alphabet.



Setting the Alarm

Introduction

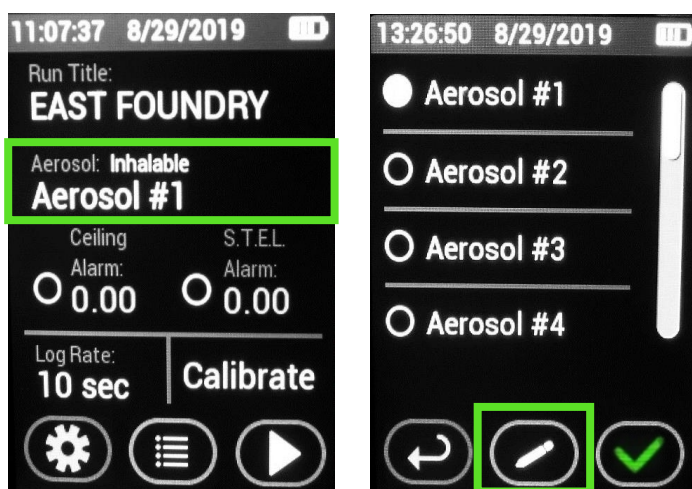
An audible alarm can be set to alert the worker of approaching threshold limits.

Alarm settings

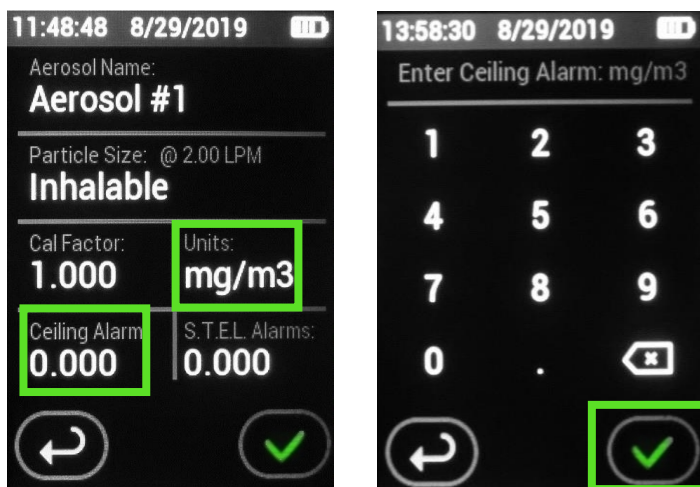
The concentration level should be set to the defined agency standard for the particulate type being sampled or users preference.

Using the alarm

1. From the “Home Screen” Press Aerosol. Press the Pen Icon to edit.



3. Next select Ceiling Alarm or S.T.E.L. alarm. If desired, the engineering units can be changed. To change the engineering units press “units.” Press the green checkmark to confirm selection.

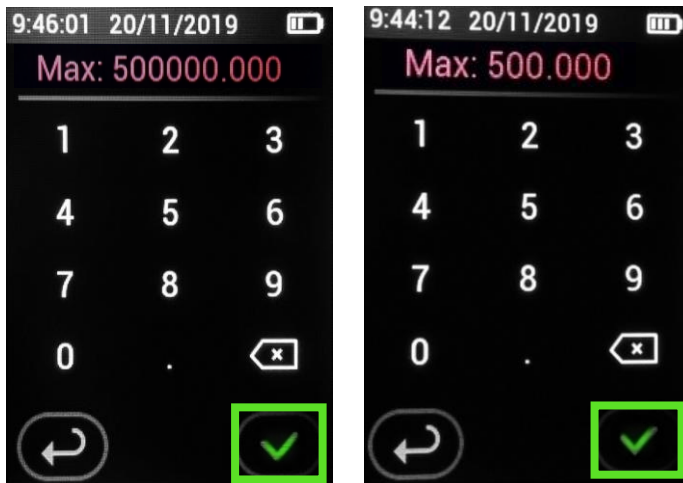


Note: Once the green checkmark is pressed, the dust profile screen reappears. The user must press the green arrow on this screen as well, or the changes will not be saved.

Note: The maximum alarm value for mg/m³ is 500 mg/m³. If the user requires monitoring over 500mg/m³ then ug/m³ unit of measurement must be selected. The SM-7204 will display the max value.

When sampling in ug/m³ the maximum concentration range is 500,000 ug/m³. Users cannot select over this.

See Page 51 for information on viewing alarm levels in real-time



Setting Date and Time

Introduction

The date and time is pre-set by the factory to Eastern Standard Time. It may be necessary to change the date and time due to local time zones, daylight savings time or as preferred for a specific geographical location.

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

Date and Time settings

The SM-7204 offers two time formats; a 12- hour setting and a 24 hour (military) option. Factory default is a 12-hour setting.

The SM-7204 offers three date formats;

MM/DD/YYYY

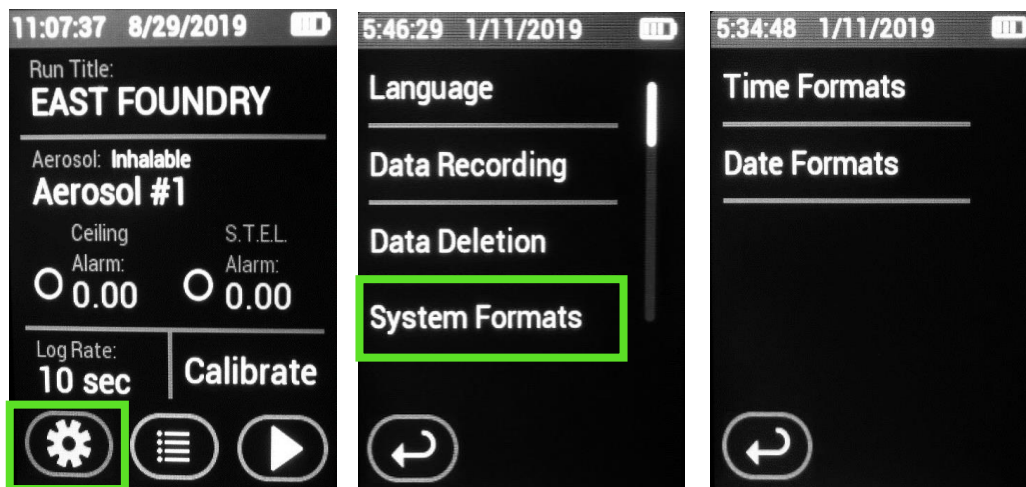
YYYY/MM/DD

DD/MM/YYYY

Factory default is MM/DD/YYYY

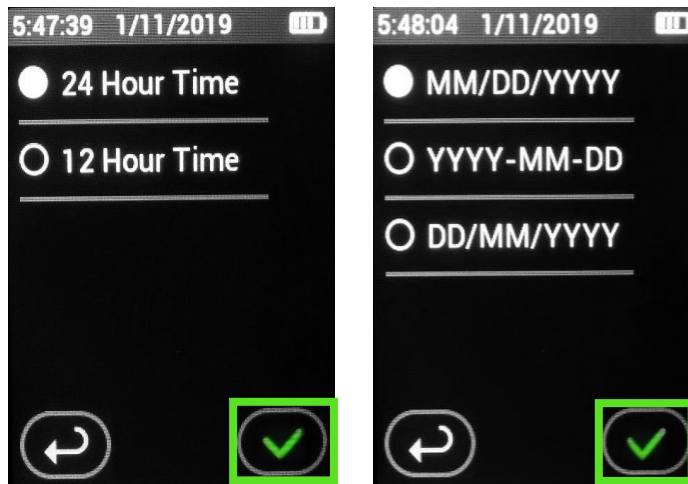
Change Date and Time format

1. From the Home Screen Select “Settings” Icon. Then Select Date “System Formats”



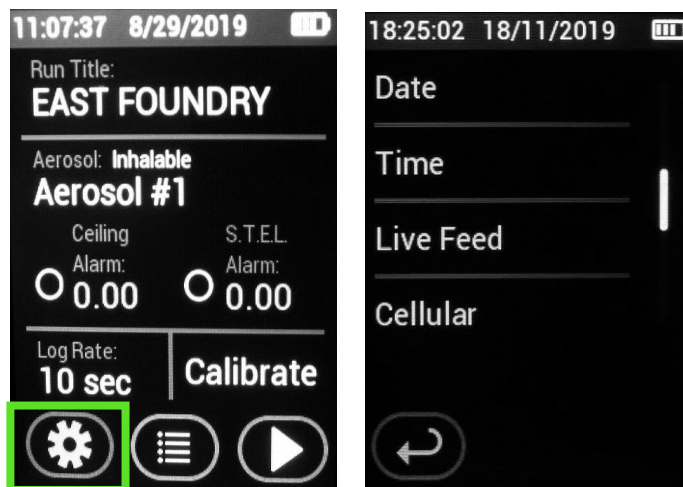
2. Next select “Time Formats and/or Date Formats”

3. Select the desired option and press the green check mark to save or press the back button to exit without saving changes.



Setting Date and Time

1. From the Home Screen Select “Settings” Icon. Then scroll down and select Date and/or Time.



2. Select the desired option and press the green check mark to save or press the back button to exit without saving changes. The change will be viewable on the information bar at the top of the Touch Screen.

Setting Log Rate

Selecting Log Rate:

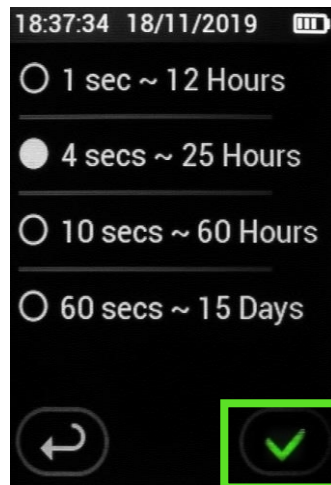
From the Main Menu select “Log Rate” Select the desired log rate. Stated after each option is the approximate memory available for each desired selection.

1 Second ~ 12 hours

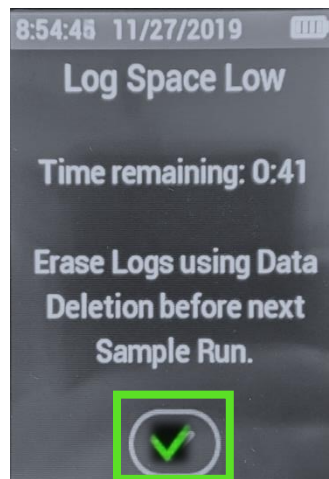
4 seconds ~ 25 hours

10 seconds ~ 60 hours

60 seconds ~ 15 days



Note: When the data storage memory is low, a message will appear. The sample will stop and data will need to be uploaded and/or erased to continue the sample run.



Data Recording

Introduction

Each data set can either be saved (preserved) or erased and rerecorded with each new data set.

Data Recording Options

1. From the “Settings” menu press “Data Recording” The select either “Preserve Logs” or “Overwrite.” Press the green check mark to save or press the back button to exit without saving changes.



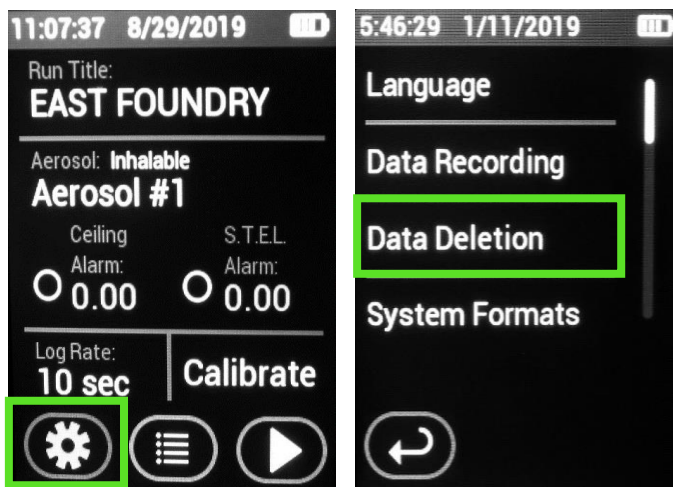
Data Management

Introduction

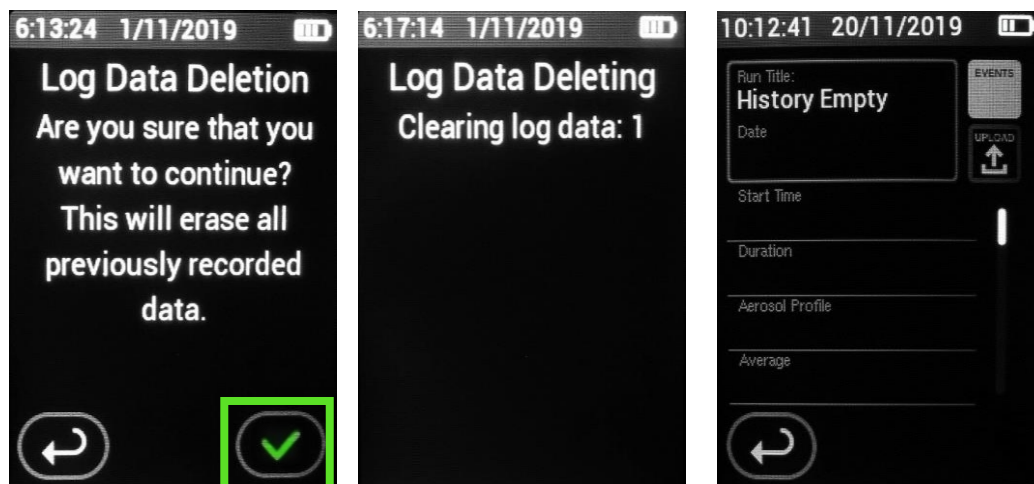
The memory of the SM-7204 can be cleared at any time. There are several options for erasing data. Data Deletion erases all previously recorded data sets while maintaining Run Titles and other unique customer entries.

Data Deletion

1. From the Home Screen Select “Settings” Icon. Then click “Data Deletion.”

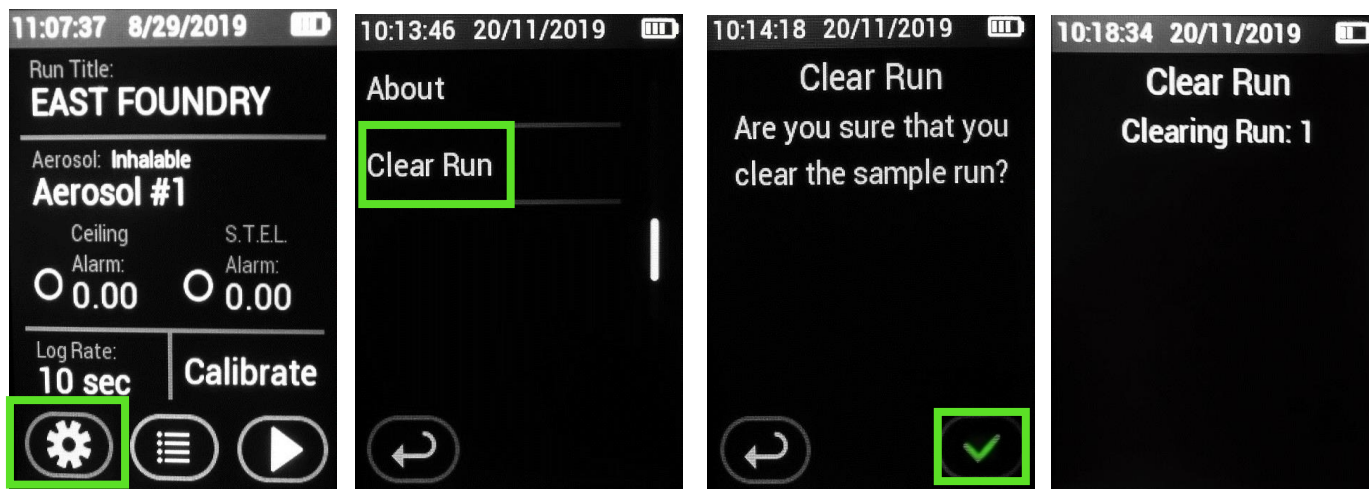


2. The SM-7204 will then prompt for confirmation. Click the green check mark to confirm and erase all data sets. Click the back button to exit without deleting any data sets. When complete the History Screen will be empty as shown in the last picture.



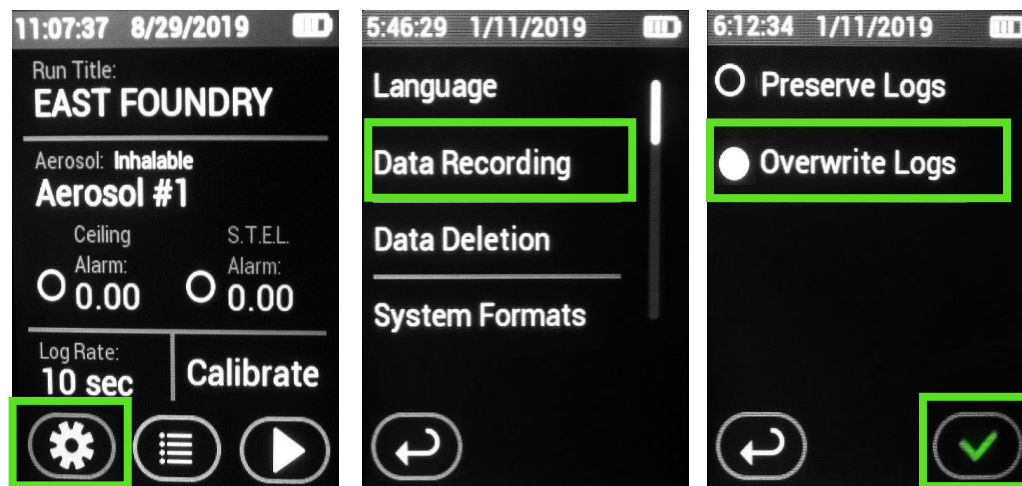
Clear Run

Clearing the run will erase all the data sets similar to performing a Data Deletion. The difference is Clearing the Run will also delete customers unique entries like Run Title, Aerosol entries and Calibration Spans. Think of the Clear Run function as a factory default.



Overwriting Data Sets

From the Home Screen Select “Settings” Icon. Then select “Data Recording”. Next select “Overwrite Logs.” When “Overwrite Logs” is selected each new data set will clear the last by overwriting.



About Screen

Introduction

The about screen states the Company, Model, Serial Number, Firmware and last Service/Calibration Date.



3. Section Three

Operating the SM-7204

Section 3- Operating the SM-7204

Introduction

This section describes and diagrams operation procedures of the SM-7204.

This section contains the following topics.

- Connecting the Sensor.....Page 37
- Selecting the Particle Size..... Page 38
- Particulate Selection.....Page 39
- Thoracic Dust Particulates..... Page 40
- Respirable Dust Particulates.....Page 41
- Inhalable Dust Particulates..... Page 42
- Auto-Zero..... Page 48
- Sampling Procedure.....Page 50
- Real Time Rolling Graphical Display...Page 51
- Stop Run.....Page 52
- Infield Calibration Verification.....Page 53
- Faults.....Page 55
- Reviewing Stored Data.....Page 56
- Uploading Data.....Page 57
- Live Feed.....Page 58

Connecting Sensor

Introduction

To connect the sensor, the signal cable must be attached the instrument.

Sensor Connection

1. Line the red circle on the black signal cable to red dash on the mating connector found on the top of the SM-7204. The connection is very easy when aligned properly.
2. Attached the tubing to the side of the instrument at the air intake.

NOTE: To remove the signal cable, grasp the silver part of the connector from the cable end as close to the instrument as possible and pull upward. **DO NOT** pull the cable to release the connection.



Figure 3-1. Sensor Cable being connected to SM-7204 and tubing connected to air intake

Selecting the Particle Size

Introduction

The inlet system of the SM-7204 can be configured to sample Thoracic, Respirable, or Inhalable or custom dust particulates. The following pages detail the selection process for each of these particle types.

Inlets

The table below lists the particulate type, agency standard, and required inlets.

Particulate	Standards	Required Inlet	Diagram Detail
Thoracic	EPA PM-10 & IP-10	Thoracic Sampling Inlet	A
Respirable	NIOSH 0600	SKC Respirable Dust GS Cyclone with adapter	B
Inhalable	NIOSH 0500	SKC IOM Sampling Inlet with adapter	C



Figure 3-2. Diagram of sampling inlets for Thoracic, Respirable, and Inhalable. Pictures are not to scale.

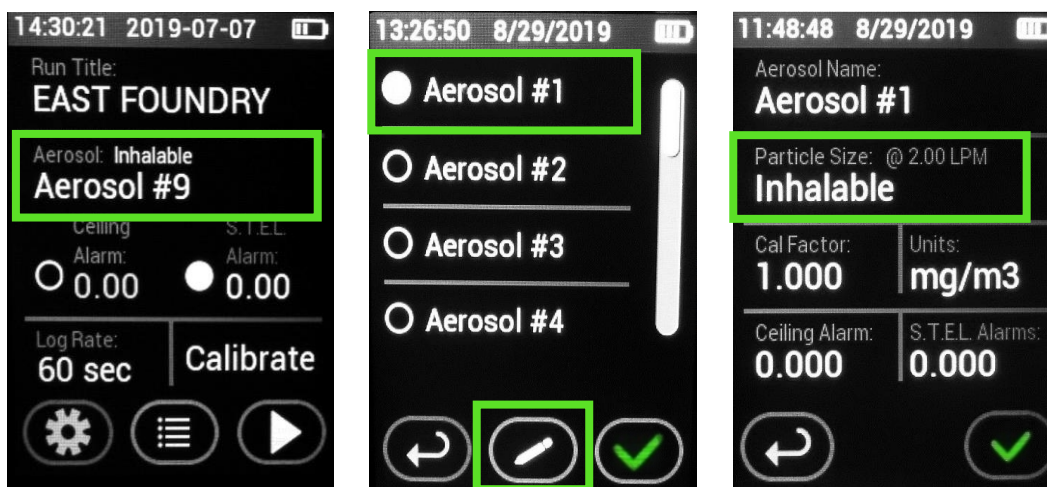
Particulate Selection

Attach the desired sampling inlet to SM-7204 air sensor. See Instructions on the following pages to insert sampling inlets.

Then, follow the steps below to select the desired size fraction.

Creating an Aerosol Profile.

1. From the Main Menu press “Aerosol”. From the Aerosol list press the pen to create a new Aerosol Profile. If a library has already been created, simply select the desired entry.



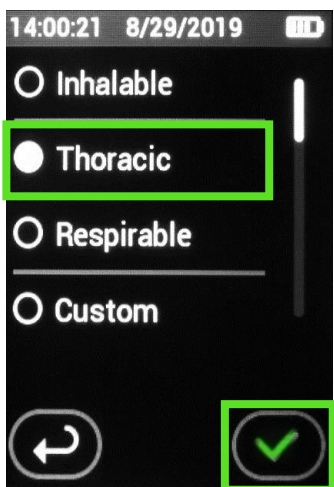
2. To Create a Dust/Aerosol profile, select the Pen. From here, users can name the Aerosol Profile, change the particle size, and change the Cal Factor, units of measurement along with setting Ceiling and S.T.E.L alarms.
3. Once the desired settings have been made, press the green check mark to confirm or press the back arrow to exit without saving changes.

Note: Once the Green check mark has been selected the instrument will bring the user to the previous screen. The Green check mark has to be pressed on each screen on the way back to the Main Menu for the settings to be saved. This is a total of three screens.

Thoracic Dust Particulates

Inserting the Thoracic Sampling Inlet

1. Select Thoracic from the Aerosol library on the instrument. See page 39 for further details.



2. Push the Thoracic sampling inlet into the bottom of the SM-7204 sensor assembly.
3. Attach the filter cassette to the top of the sensor.
4. Attach the air intake tubing to the top of the filter cassette for proper flow. The flow will automatically change to 2.0LPM with the thoracic selection. This can be verified with a flow meter of choice.

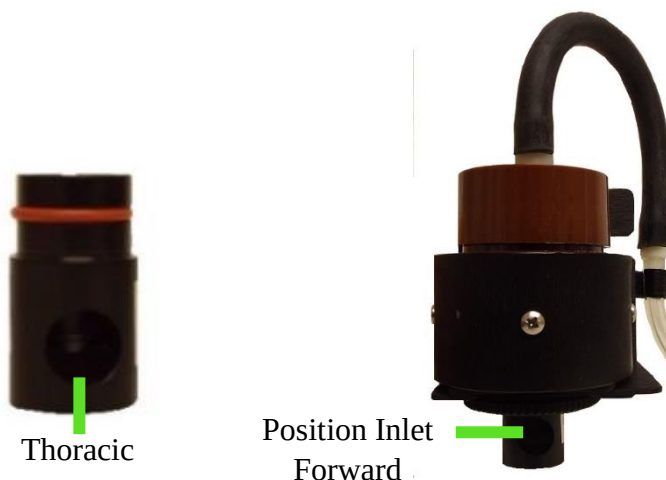


Figure 3-3. P/N TS-104 Thoracic Inlet - pushes into bottom of SM-7204 sensor

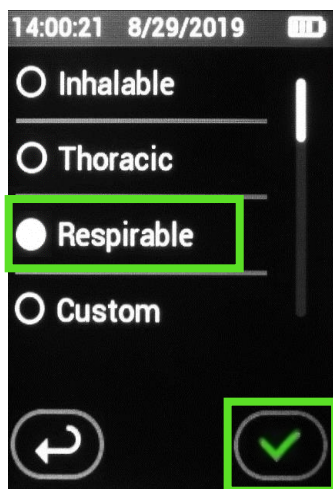
Note: If collecting concurrent 37mm filter samples place a gravimetric filter in the filter cassette. Pre-weighed and preloaded filters cassettes of choice can also be used.

Respirable Dust Particulates

Inserting the Cyclone for Respirable Sampling

The GS-3 Cyclone for Respirable Sampling requires a cyclone adapter (part number GSA-204). The GS-3 Cyclone should have the GSA-204 adapter already inserted. If not insert the GSA-204 into cyclone as shown.

1. Select Respirable from the Aerosol library on the instrument. See page 39 for further details.



2. Push the GS-3 Cyclone with attached GSA-204 adapter into the bottom of the SM-7204 sensor assembly.
3. Attach the filter cassette to the top of the sensor.
4. Attach the air intake tubing to the top of the filter cassette for proper flow. The flow will automatically change to 2.75 LPM for the Respirable selection.

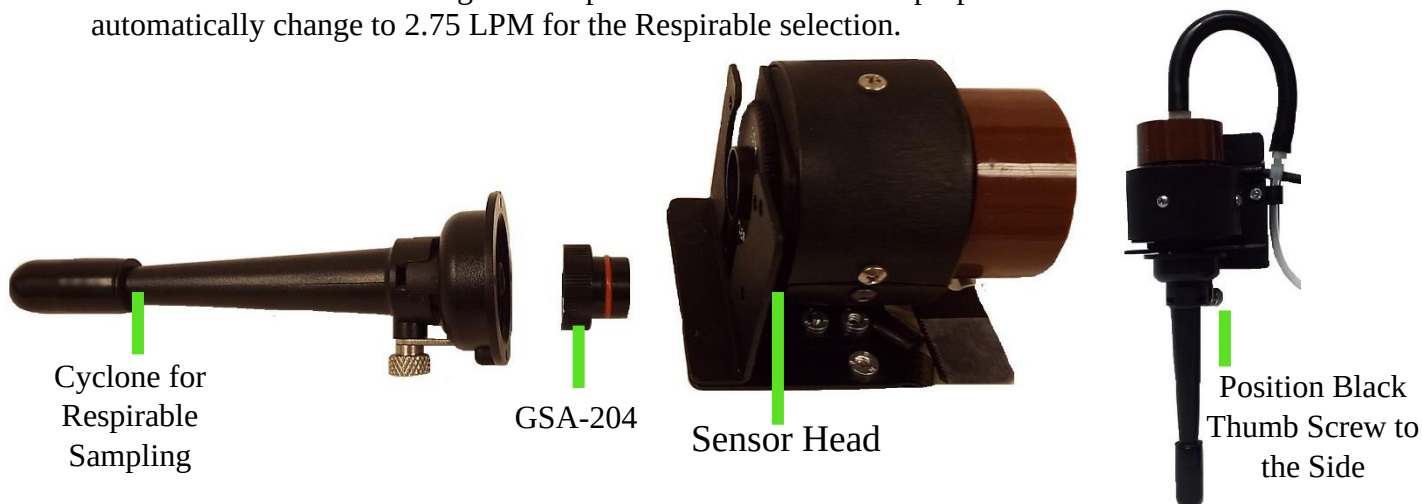


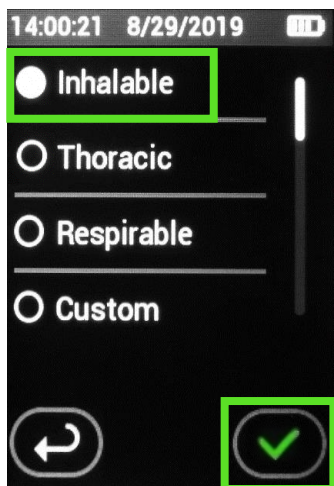
Figure 3-4. Component identifications from left to right: SKC GS-Cyclone for Respirable sampling, GSA-204 adapter, sensor head, filter cassette, and air intake tubing.

Note: If collecting concurrent 37mm filter samples place a gravimetric filter in the filter cassette. Pre-weighed and preloaded filters cassettes of choice can also be used.

Inhalable Dust Particulates

Inserting the IOM for Inhalable size fraction.

1. Select Inhalable from the Aerosol library. See page 39 for further details.



2. The SKC IOM is factory installed on the sensor. Simply remove any sampling inlets, if attached.
3. Attach either a 25mm filter cassette or a 37mm filter cassette as shown below. Note: the orientation of the sensor will need to be changed for 25mm sampling. A video on how to change the sensor orientation is available on our website at <https://environmentaldevices.com/video-instruction/>

Note: For full instructions of how to change orientation see next page.

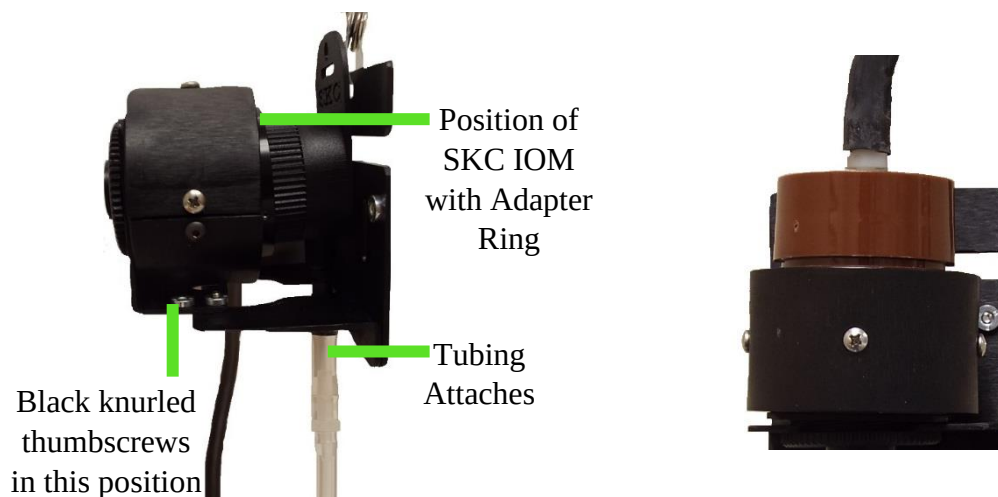


Figure 3-5. Sampling for Inhalable Dust using 37mm or 25mm filter cassette.

Note: If collecting concurrent 37mm filter samples place a gravimetric filter in the filter cassette. Pre-weighed and preloaded filters cassettes of choice can also be used.

Orientation of the 25mm IOM for Inhalable size fraction

1. Remove SM-7204 sensor from lapel bracket by unclipping sensor cable and tubing from plastic clips on back of lapel bracket and removing the two black knurled thumbscrews as shown in Figure 1 below. Remove existing sampling inlet if any are attached.

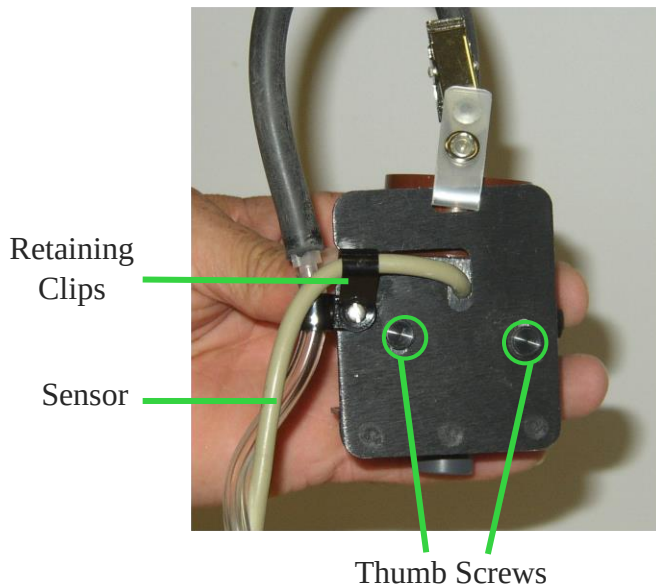


Figure 3-6. Unclip sensor cable and tubing from retaining clips, and Remove Black Knurled Thumbscrews

IS-104 Assembly



Figure 3-7. P/N IS-104 Inhalable Sampling Head and P/N IA-204 Inhalable sampling Adapter

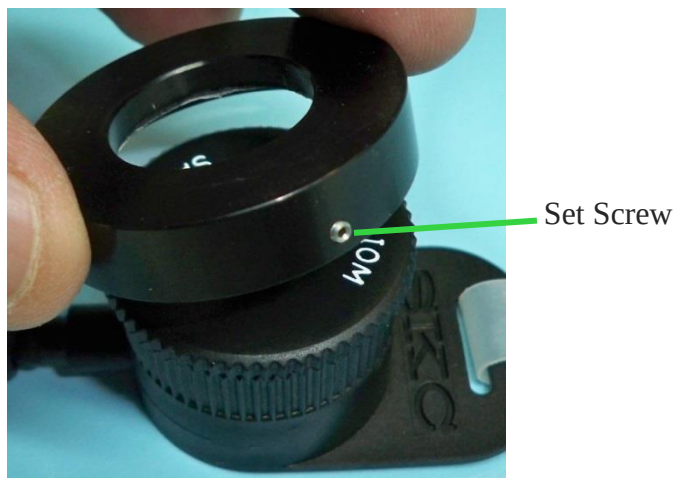


Figure 3-8. Place IA-204 adapter ring over IOM

2. Place IOM front plate adapter ring (P/N IA-204) over Inhalable Sampling Head IOM cassette front (P/N IS-104). Press on firmly to ensure cassette front makes firm and even contact with gasket on inside of adapter ring. Using provided hex wrench, tighten four (4) set screws on outside of adapter ring. Make sure screws are recessed below screw hole for an airtight fit.
3. Remove protective tape on gasket material from inside of front plate adapter ring. Place IOM front plate adapter ring over IOM cassette front. Press on firmly to ensure cassette front makes firm and even contact with gasket on inside of adapter ring. Using provided hex wrench, tighten four (4) set screws on outside of adapter ring. Make sure screws are recessed below screw hole for an airtight fit.
4. SKC IOM assembly with adapter ring (P/N IA-204) assembled in Step 1. can be inserted into the SM-7204 optical sensor by a push/twist motion into back of sensor for an airtight O-Ring seal.

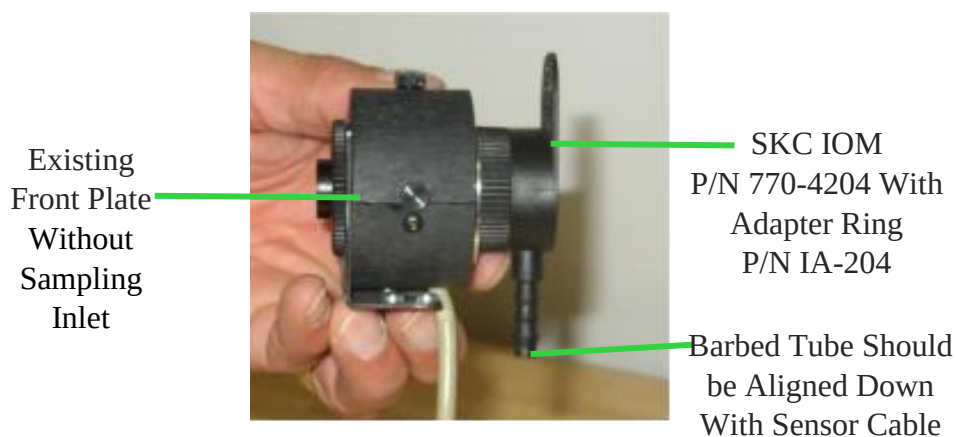


Figure 3-9. Insert assembled adapter ring into optical sensor

5. Reassemble sensor onto lapel bracket in a horizontal position, as shown in Figure 5 below, and secure with black knurled thumbscrews.

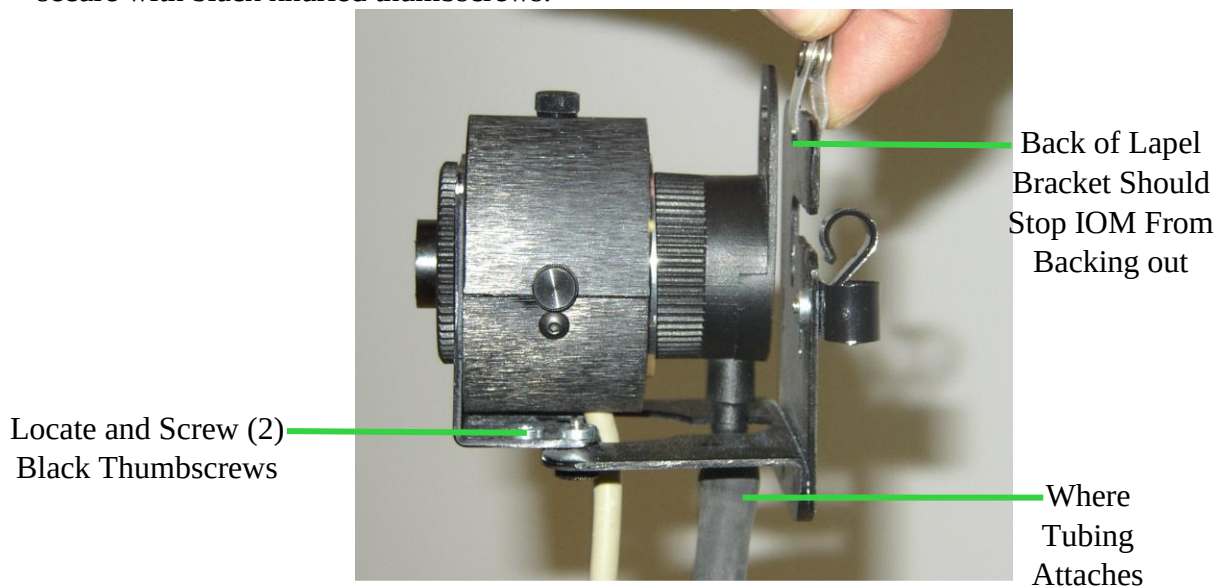


Figure 3-10. Reassemble Sensor

Note: Operate SM-7204 monitor flow rate at 2.0LPM for an inhalable particulate size separation. See supplied SKC IOM Instructions for further details

Flow Rate

Introduction

The flow rate will automatically adjust when selecting Respirable Thoracic and Inhalable as follows:

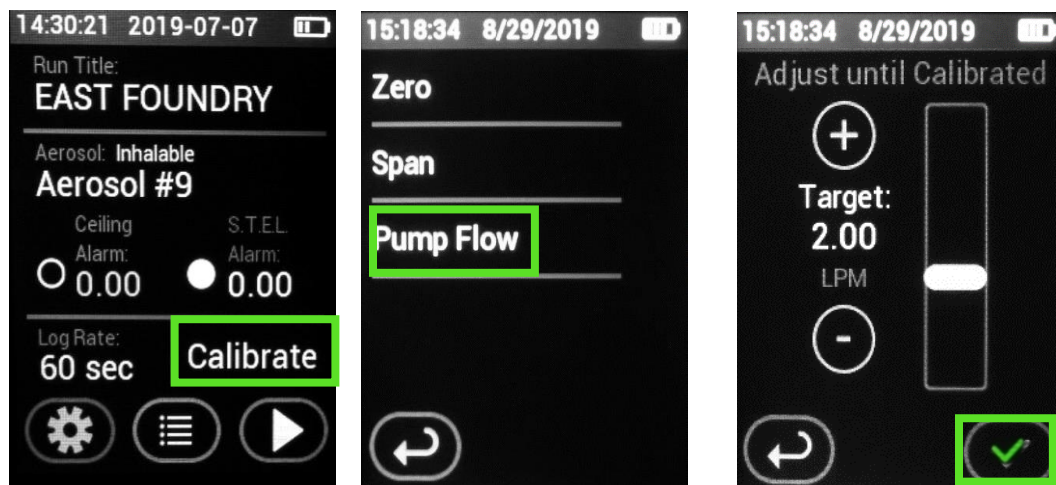
Respirable 2.75 LPM

Inhalable 2.0 LPM

Thoracic 2.0LPM

Calibrating Flow Rate

To calibrate flow, select “Calibrate” from the main menu. Then select “Pump Flow” use  and  to change the flow. Note: The plus and minus buttons will not change the display target on the SM-7204. Pressing the +/- will change the actual flow displayed on the flow meter. The target flow will be displayed, in order to verify the flow you will need to use a flow meter.



Verifying Pump Flow

To verify the pump flow you will need to use a flow meter of choice.

1. See page 39 for detailed instructions on how to change from Respirable, Inhalable, and Thoracic sampling. Once the correct size fraction has been selected proceed to Step 2.
2. Insert the flow adapter with tube into the bottom of sensor as shown in figure 3-11. Then Insert the opposite end of the tubing onto the flow meter of choice as shown in figure 3-12 confirm that the flow shown on the instrument matches the flow on the flow meter.

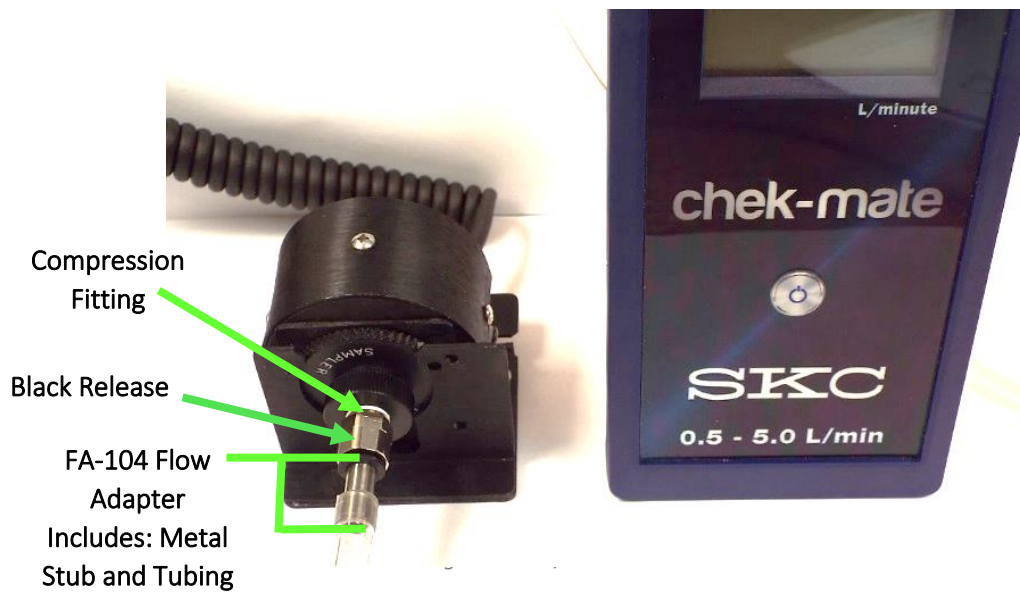


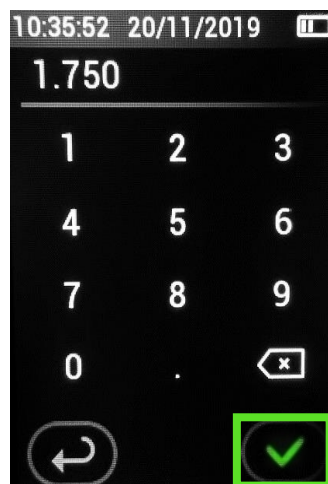
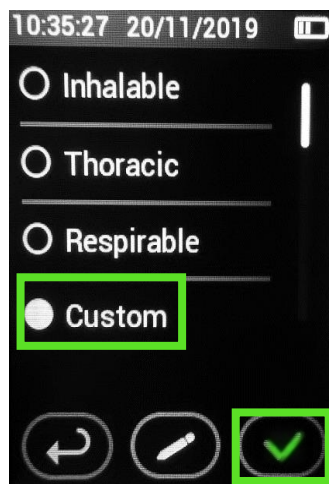
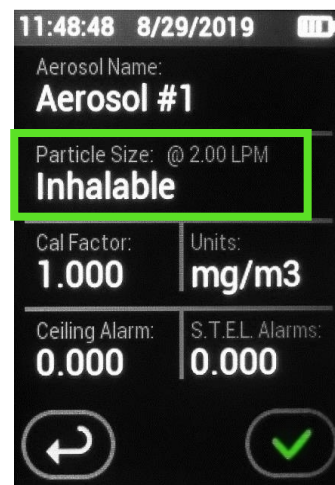
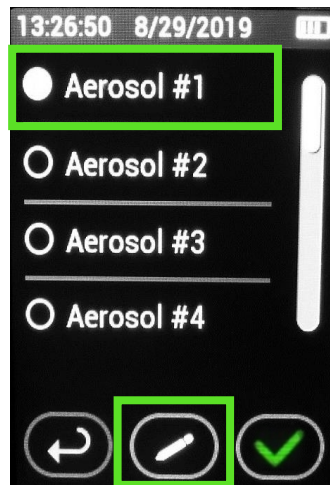
Figure 3-11. P/N FA-104 Inserted into Sensor



Figure 3-12. Connecting SM-7204 to SKC chek-mate

Custom Flow Rate

The SM-7204 also offers a custom entry. By pressing “Particle Size” then selecting “Custom” users can enter a desired flow rate. The flow can be verified by flow meter of choice.



Zero Calibration

Introduction

The Zero Calibration commonly referred to as the Auto-Zero sets the measurement baseline of the SM-7204 to zero mg/m³ or ug/m³ depending on user selection. Preform Auto Zero prior to collecting a new data set.

Inserting the Zeroing Filer

The Auto Zero function is based on a Pass/Fail system approach. If the Auto Zero fails, try again. If it fails again, there is something wrong. Please contact Tech Support at techsupport@hazdust.com

Note: The sensor needs to be attached for the Auto Zero to preform properly.

If Sampling...	Then...
Thoracic Particulates	Insert the zeroing filter into the Thoracic sampling inlet.
Inhalable Particulates	Insert the zeroing filter (p/n ZA-7204) into the front of the IOM front plate
Respirable Particulates	Remove the Cyclone and insert the ZA-7204 into the sensor same as the Inhalable with the sensor rotated 90 degrees.



Figure 3-13. Zeroing filter (p/n ZA-7204) being attached to the Thoracic sampling inlet.



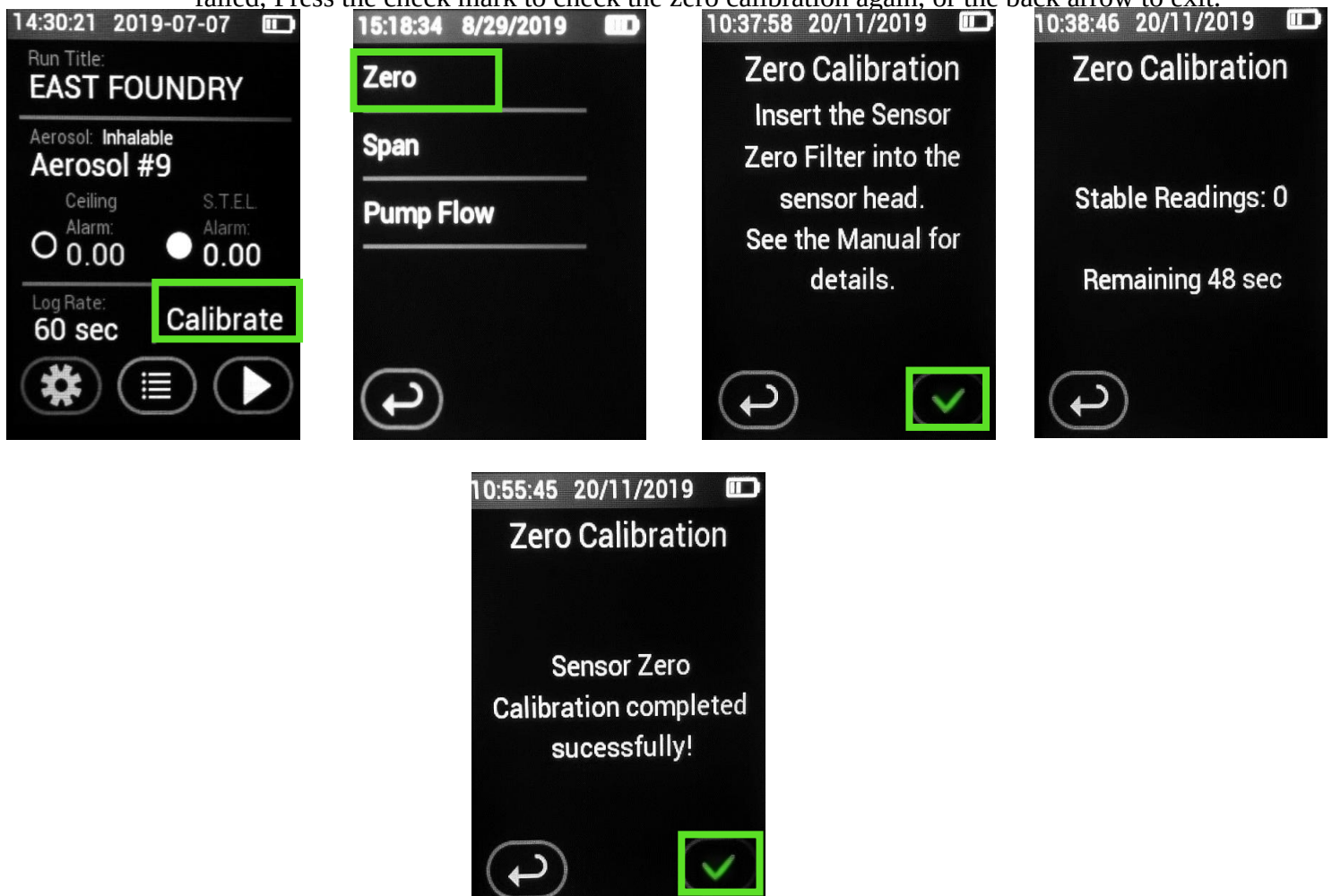
Figure 3-14. Zeroing filter (p/n ZA-7204) attached to the IOM Inlet.

Zero Calibrate Function

1. From the Main Menu press “Calibrate” Then press “Zero”
2. After inserting the zeroing filter as shown on Page 48, select the green check mark to continue.
3. The Zero Calibration screen will appear and run the auto zero for 50 seconds. When three stable readings taken together the in Zero Calibrate will be successful

While the Zero Calibration is in active mode, the number of stable reading will be displayed. The SM-7204 requires three consecutive stable readings to pass. Three successful stable readings will be displayed on the screen as “Stable Readings :1” If six consecutive stable readings are recorded the display will state “ Stable Readings: 2”

When finished, the display will state whether the instrument passed or failed. If the instrument failed, Press the check mark to check the zero calibration again, or the back arrow to exit.



Sampling Procedure

Once you have selected a Particle Size, inserted the appropriate sampling inlet and completed the Auto-Zero process, the SM-7204 is ready to begin sampling.

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

Condition...	For further Information See Page...
The correct particle size must be selected.	Page 39
The correct sampling inlet must be attached.	Page 39
The correct date and time must be set.	Page 28
The Auto-Zero process must be complete.	Page 48

Note: All other parameters (day, time, sample rate, language, aerosol profile, units of measurement, etc) should be set, although not required to run.

1. From the main menu select the “Start” button.
2. The internal pump is activated and the sampling process begins, and real time recordings are displayed.
3. Attach the SM-7204 to the belt of the worker and attach the sensor to the OSHA defined breathing zone.

Real-Time Data Viewing

Introduction

The SM-7204 offers a real time rolling graphical display and statistics during sampling.

Real- Time Rolling Graphical Display

There are three viewing options for looking at real-time data.

Ten Second Graphical Display.

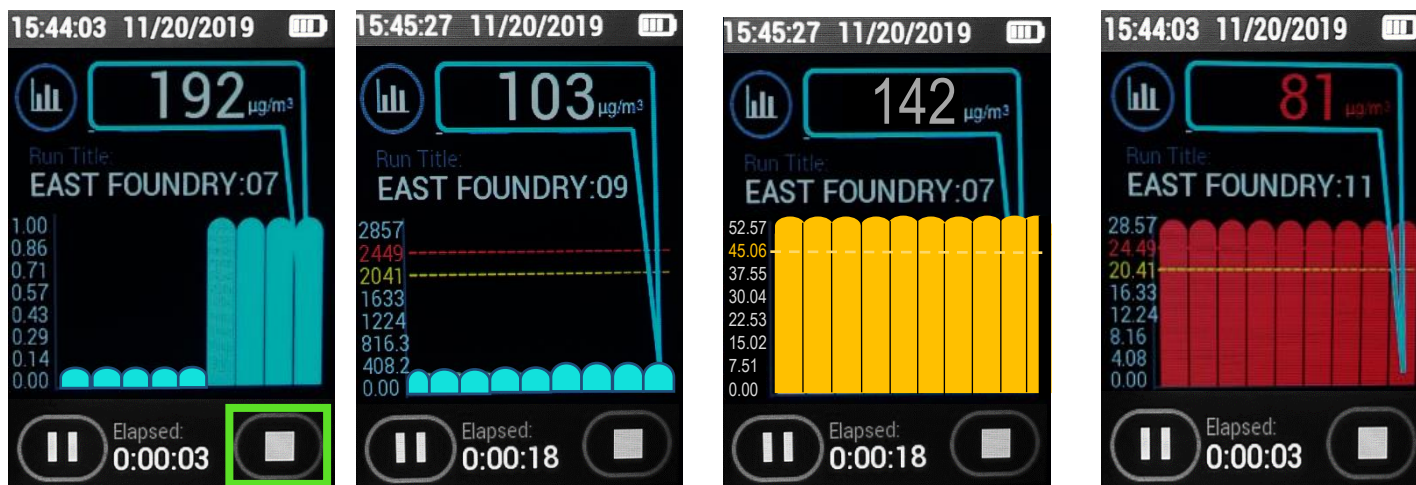
Upon starting a sample, the user will be automatically brought to the first of the three viewing options. The first is a 1 second rolling graph. The display will show the run title, the real-time mass concentration, elapsed run time, pause sample and stop sample.

The second viewing option is a 10 second rolling graph. The display will show the run title, the real-time mass concentration, elapsed run time, pause sample and stop sample.

The third viewing option lists the real-time statistics including (Run Title, Aerosol Profile, Average, 8 Hr TWA, Min, Max, Ceiling and STEL alarms, Log Rate, Start time, Particle Size, Flow, and elapsed time.

See page 26 on setting alarm levels. Once the alarm is set the rolling graph will display a yellow line of the STEL and red line for the ceiling alarm. When the STEL alarm threshold has been met the graph will appear yellow. When the ceiling alarm levels are met the graph will turn red. Otherwise the graph will be blue.

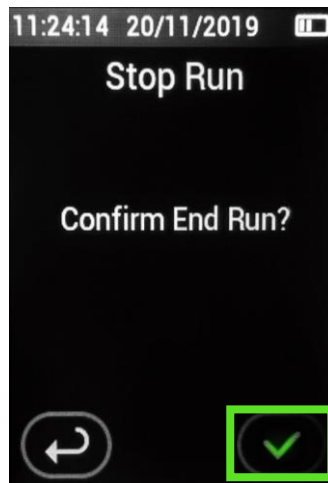
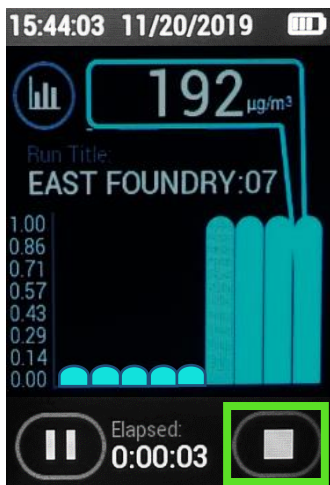
In order to go back and view other screens the sample must be stopped.



Stop Run

STOP RUN

To stop sampling, press the Stop Icon. A prompt will appear asking if the user really wishes to stop sampling. In order to access other menu options, the user must stop sampling.



Infield Calibration Verification

Introduction

The SM-7204 offers users the ability to verify the instrument is within +/- 10% of factory calibration when using the Calibration Span Reference accessory (p/n CS-7204). This unique feature allows users to have confidence in taking meaningful data.

The SM-7204 will monitor the scattered light from the infrared emitter and register the light on and off; this is displayed as a high and low reading. The high and low need to match in this internal process to pass the calibration verification test. If the emitter is not consistent during this process the instrument will fail the calibration span verification.

The calibration span should be checked under the following conditions:

- Once a month with normal usage.
- If the SM-7204 is dropped or otherwise damaged.
- The first time you use the instrument to double check the factory calibration.

Note: The SM-7204 should be sent into EDC annually for recalibration.

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

- The environment must be relatively clean air
- The battery must be fully charged.

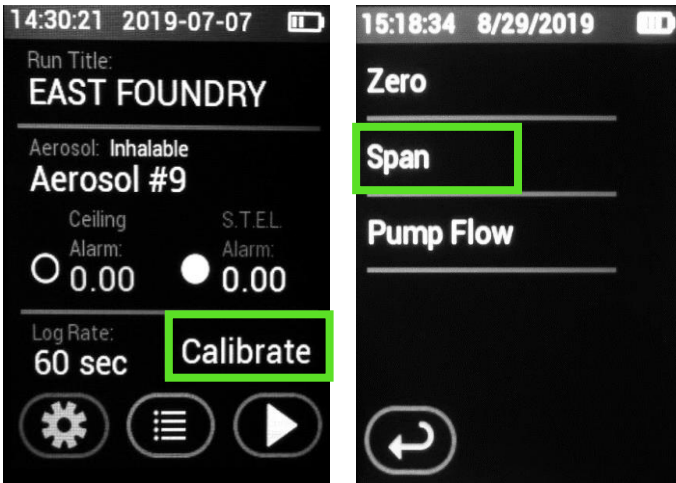
Procedure for Using Calibration Reference

1. Insert the CS-7204 into the sensor as shown in figure below.

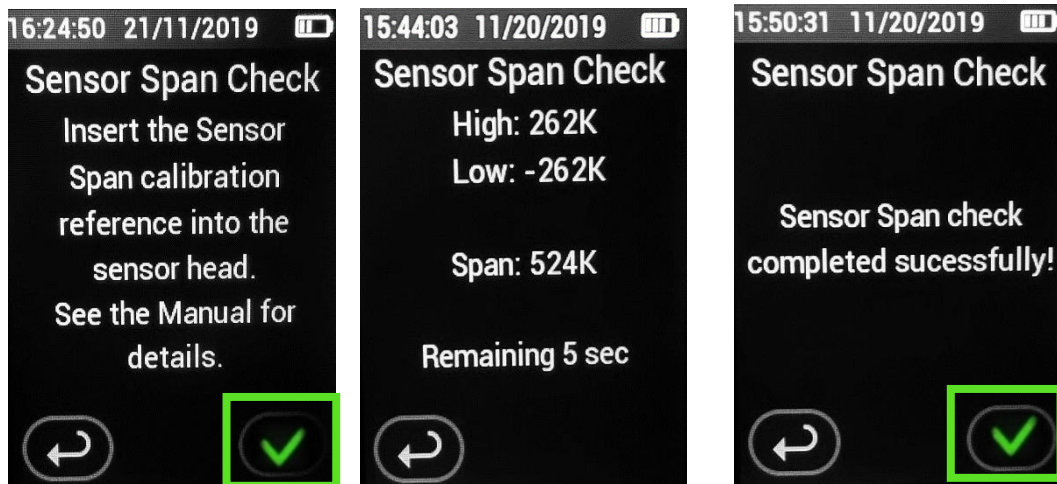


Figure 3-15. CS-7204 being inserted into SM-7204 sensor

2. Press “Calibrate” from the home screen. Then Press “Span”



3. The SM-7204 will then prompt the user to insert the CS-7204.
4. The instrument will then start the verification process and enter the Sensor Span Check screen. The process takes 30 seconds. Once complete the instrument will display a pass or fail.



5. If the instrument passes the Span Check the user must remove the CS-7204 prior to starting the sample run. If the instrument fails the Span Check try again and contact Technical Support for assistance if the instrument fails on the third attempt. The instrument will need to be factory serviced.

Faults

Introduction

The SM-7204 will fault if the pump is not working properly or the battery is low.

Flow Faults

The pump will fault if there is kinked tubing or overloaded sample and can no longer sample with +/- 5% pump. If the event is sustained for 3-10 seconds pump will enter flow fault mode and stop running. The lights flash Purple.



Figure 3-16. Flow Faults cause purple lights to flash

After 20 seconds the pump will attempt to restart 5 times.
If pump restored during the 5 attempts, then sample as usual.
If pump doesn't restore within 5 minutes the pump will end the sample.

Battery Fault

When the battery status is low the lights will flash red.



Figure 3-17. Battery Faults cause red lights to flash

Note: When viewing history, the faults will be indicated for each date set as a numerical value listed under “Events.” The SM-7204 does not differentiate between a pump fault and a battery fault.

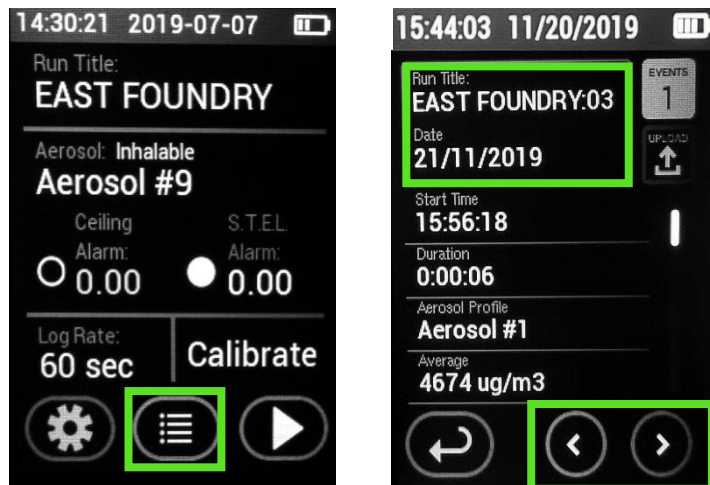
Reviewing Stored Data

Introduction

The SM-7204 provides the user to view sample run statistics contained within individual data sets.

How to Review Stored Data

1. From the Main Menu Press the History button. To access previous data sets, touch the left arrow or right arrow.
2. Next to the Run Title is a number. The number displayed represents the number of the data sets. When pressing the left arrow, the number will decrease to represent the last data set taken.



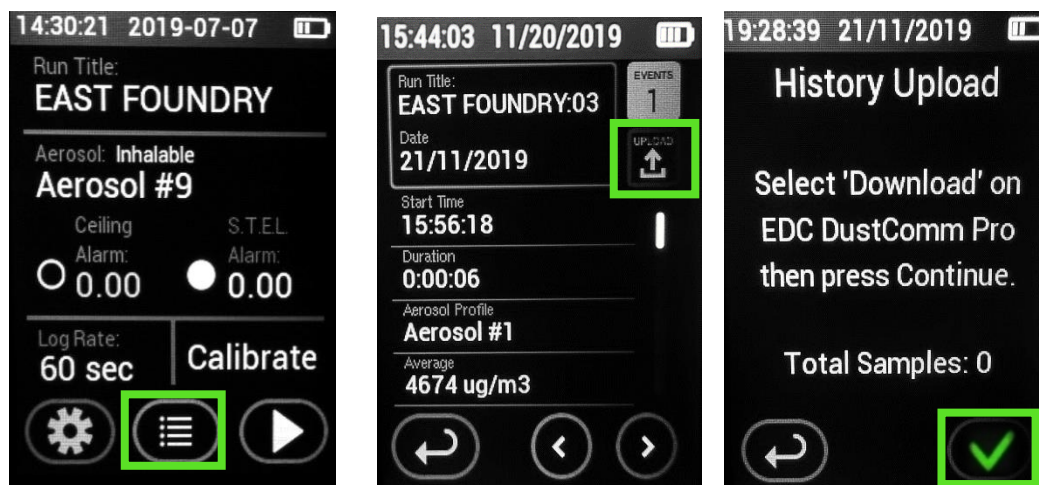
Uploading Data

Introduction

In order to upload Data the SM-7204 must be connected to a computer using the Micro USB provided. The data will upload from the instrument to the HAZCOMM Pro Software. The upload will only work on Windows 10. It is not supported on earlier versions on Windows.

Uploading Data Procedure

1. From the Main Menu press the History button. Then press the upload button. Follow the detailed instruction in the Software Section of this Instruction Manual.



Live Feed

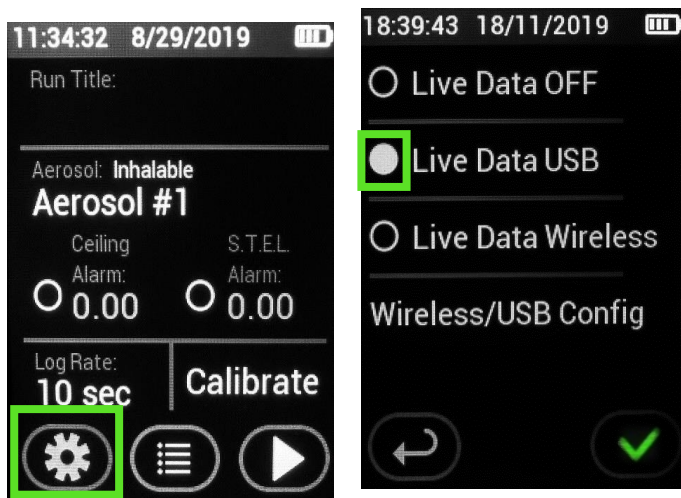
Introduction

The SM-7204 offers a live feed option. This option will allow users to graph and see real-time concentration values and graphing on a PC. This feature requires the device to be hardwired to a PC or laptop unless wireless options were purchased with the instrument.

Note: In order to download the live feed data has to be turned off.

Setting Up Live Feed

1. From the Home Screen Select “Settings” Icon. Then select “Live Feed”. Next select “Live Data USB.”



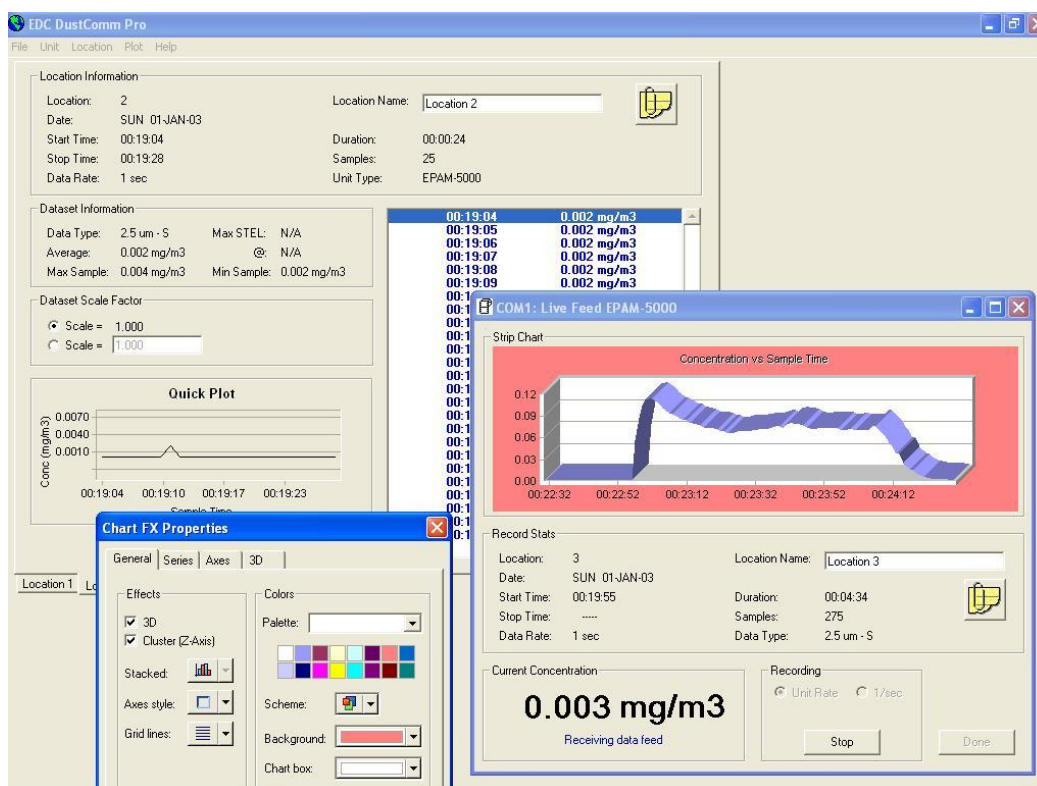
2. Plug the micro USB supplied with the instrument to the PC.
3. From the DustCom Software Select the “Live Feed” Option from the pull down menu.
4. If any wireless options were purchased select “Live Data Wireless.” See Section for Wireless Live Feed to configure the live feed.

Note: See DustComm Pro Section of the Manual to set up Com Port

Live Feed Feature

Used with optional Wireless Radio data modems

1. On the “Unit” pull down window of the DustComm Pro software select “Live Feed.”
2. Connect optional Wireless mode of communication.
3. Select “Record”



4. Section Four

Dustcomm Pro Software

Section 4- Using DustComm Pro Software

Introduction

This section describes how to operate DustComm Pro Software.

This section contains the following topics.

- Introduction to DustComm Pro Software Page 62
- Installing DustComm Pro Software..... Page 63
- Loading DustComm Pro Software..... Page 64
- Menu Selection Page 65
- File Menu Commands..... Page 66
- Downloading Data..... Page 67
- Dust Comm Pro Windows.....Page 69
- Translating Data to an ASCII Text File..... Page 71
- Generating a Plot..... Page 72
- Data Plot Menu Selections..... Page 73
- Editing Title..... Page 75
- Applying a Correction Factor..... Page 76
- Inability to Download Data to PC..... Page 77

Introduction to the DustComm Pro Software

Introduction

DustComm Pro is a powerful and flexible Windows application software package designed for use with the Haz-Dust Particulate Monitoring Equipment. DustComm Pro 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.

Note: In order to download the live feed data has to be turned off

Spreadsheet Applications

DustComm Pro easily translates data into spreadsheet .CSV files. These files can be opened in spreadsheet programs such as Microsoft Excel

Data plots

The data plots provided with DustComm Pro 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 Pro Software

Introduction

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

NOTE: When the SM-7204 will only work with Windows 10. When installing the DustComm Pro error popups will appear at different times during the installation process. Please proceed. Windows 10 had a change in design, meaning that the Operating System now recognizes all software that is not Microsoft Software. So upon installing the DustComm Pro Software, the computer will recognize that the DustComm Pro is not a Windows Program and thus not part of the registry. When installing the software click “continue” or “ok” with all pop-ups and the software will install. Once finished go to “All Programs” and open the software.

Minimum System Requirements

Windows 10.

Software Installation

Note: It is assumed that the USB is inserted into an available drive.

Start Windows, and close all open applications.

1. Insert *Installation USB* into an available USB port.
2. Open “My Computer”, and Select the folder named “DustComm Pro” and double click to enter.
3. Select the icon named “Setup” and double click.
4. Follow the installation wizard steps.

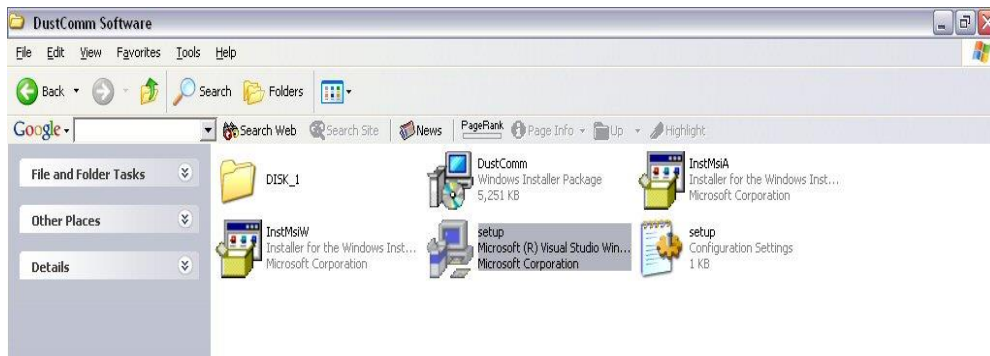


Figure 4-1. DustComm Pro Software Folder with “Setup” Selected in Windows XP

Loading DustComm Pro Software

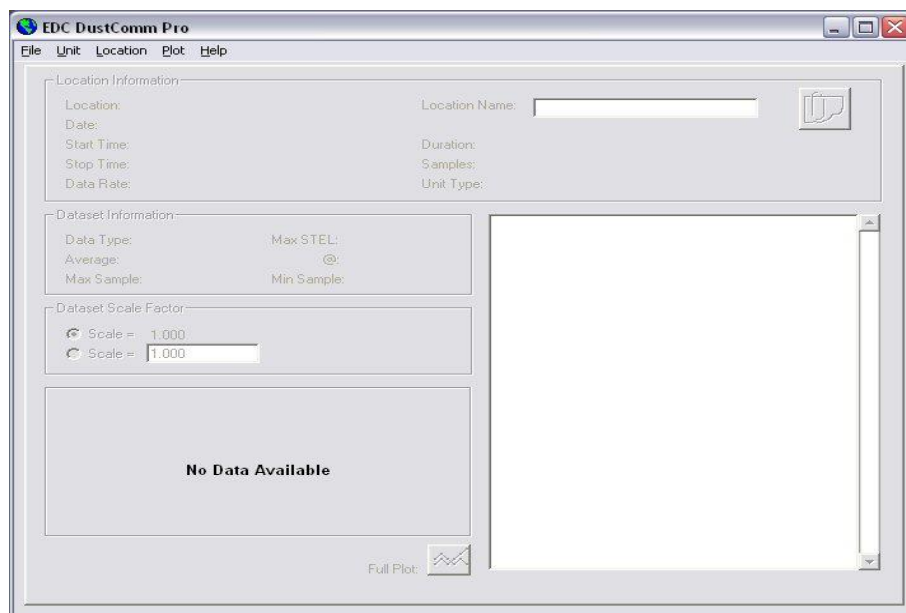


Figure 4-2. DustComm Pro Screen immediately after loading software

Menu Selections

Introductions

Figure 4-3 through Figure 4-5 show each of the DustComm Pro menu options.

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

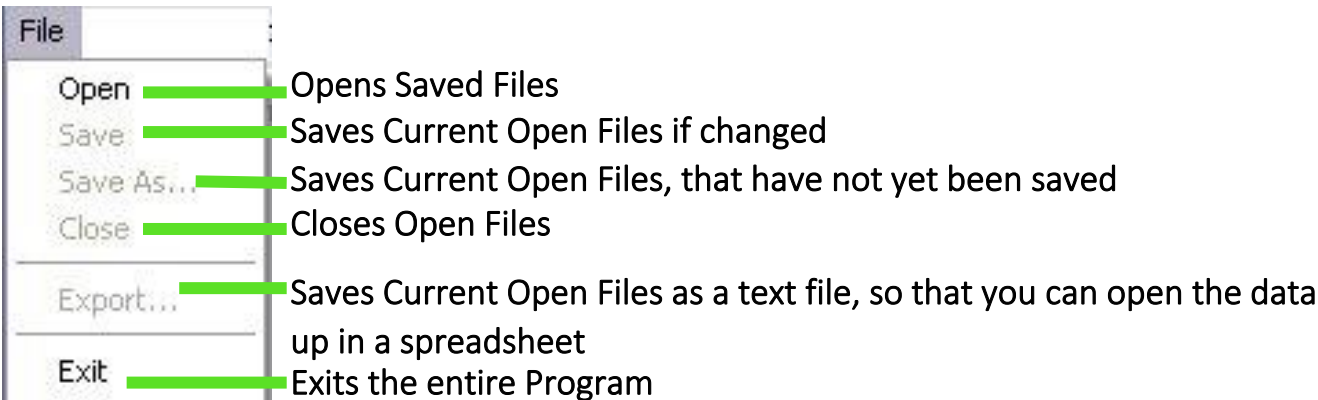


Figure 4-3. File Menu Options.

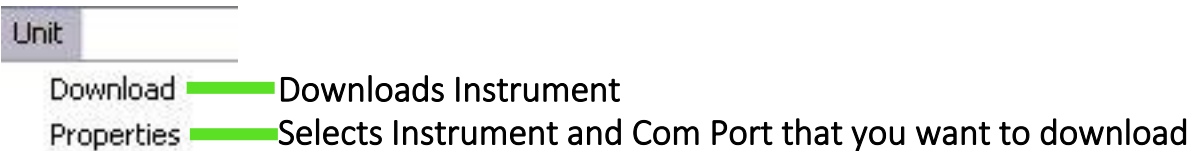


Figure 4-4. Unit Menu Options.

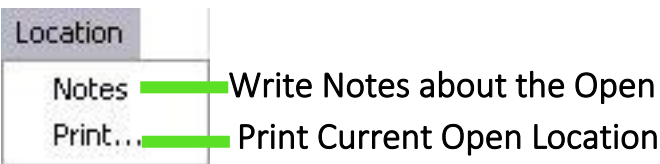


Figure 4-5. Location Menu Options.

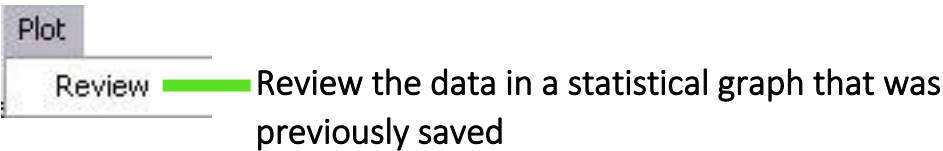


Figure 4-6. Plot Menu Options.

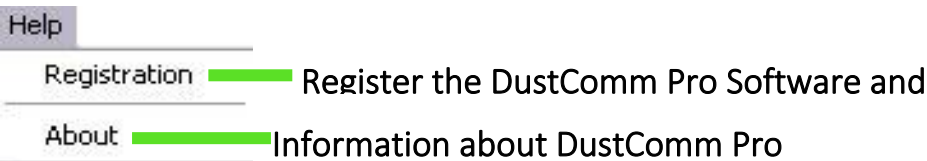


Figure 4-7. Help Menu Options

File Menu Commands

Introductions

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.

1. Select File. Then, Select Open.
2. Double click on the desired Project Folder.

Note: DustComm Pro 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.

1. Select File.
2. 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.

Exit Software

Exit Communication Software in one of two ways.

1. Select File. Then Select Exit.
2. OR Single click on the “X” in the upper right hand corner of the screen.

Downloading Data

Introductions

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

Downloading Data

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

If...	Then Select...
• Saving the data in the project folder for the first time, or, • Saving an existing folder to a new name or location.	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

1. Connect the cable.
2. Prepare the PC for data

transmission.

3. Prepare the EDC dust-monitoring unit for data transmission.

Connect the Cable

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

1. Connect one end of the supplied micro USB cable to the EDC dust-monitoring unit.
2. Connect the other end of the micro USB 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 (data sets) will be separated by tabs at the bottom of the program.

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.

Preparing the Unit

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

1. Select Review Data from the Main Menu on the unit.

2. Select Download.
3. Select To Dust Data Collector. Press ENTER.

Result: The Transmitting window appears.

Note: Bars on the PC screen should increase as the unit downloads.

When the transmission is complete...

- The To Dust Data Collector selection screen is displayed on the units display. The unit may be shut off at this time.

The downloaded data is displayed in the Project Folder on the PC. (Figure 4-8).

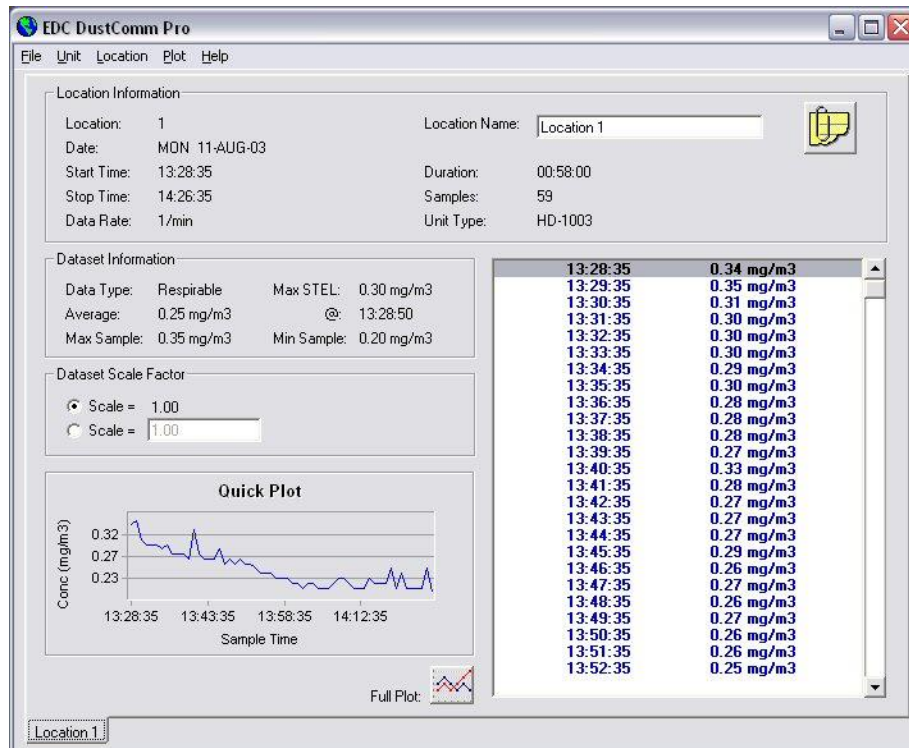


Figure 4-8. Project File after data has been transmitted.

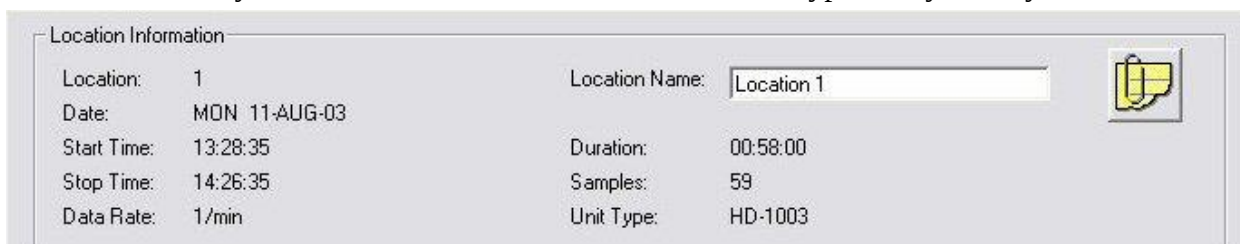
DustComm Pro Windows

Introductions

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 were 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.



The screenshot shows the 'Location Information' section of the DustComm Pro window. It contains the following fields and values:

Field	Value
Location:	1
Date:	MON 11-AUG-03
Start Time:	13:28:35
Stop Time:	14:26:35
Data Rate:	1/min
Location Name:	Location 1
Duration:	00:58:00
Samples:	59
Unit Type:	HD-1003

There is a yellow notepad icon in the top right corner of the section.

Figure 4-9. 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.



The screenshot shows the 'Dataset Information' section of the DustComm Pro window. It contains the following fields and values:

Field	Value
Data Type:	Respirable
Average:	0.25 mg/m3
Max Sample:	0.35 mg/m3
Max STEL:	0.30 mg/m3
@:	13:28:50
Min Sample:	0.20 mg/m3

Figure 4-10. Dataset Information section of the DustComm Pro Window.

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. If a Calibration Factor is entered into the device during a sample it will not be carried over to the DustComm Pro Software. This will need to be entered manually.



The screenshot shows the 'Dataset Scale Factor' section of the DustComm Pro window. It contains two radio buttons and a text box:

- ☒ Scale = 1.00
- ☐ Scale =

Figure 4-11. 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.



Figure 4-12. Quick Plot & Full Plot Button on the DustComm Pro Window.

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/m ³
13:29:35	0.35 mg/m ³
13:30:35	0.31 mg/m ³
13:31:35	0.30 mg/m ³
13:32:35	0.30 mg/m ³
13:33:35	0.30 mg/m ³
13:34:35	0.29 mg/m ³
13:35:35	0.30 mg/m ³
13:36:35	0.28 mg/m ³
13:37:35	0.28 mg/m ³
13:38:35	0.28 mg/m ³
13:39:35	0.27 mg/m ³
13:40:35	0.33 mg/m ³
13:41:35	0.28 mg/m ³
13:42:35	0.27 mg/m ³
13:43:35	0.27 mg/m ³
13:44:35	0.27 mg/m ³
13:45:35	0.29 mg/m ³
13:46:35	0.26 mg/m ³
13:47:35	0.27 mg/m ³
13:48:35	0.26 mg/m ³
13:49:35	0.27 mg/m ³
13:50:35	0.26 mg/m ³
13:51:35	0.26 mg/m ³
13:52:35	0.25 mg/m ³

Figure 4-13. Location Data on the DustComm Pro Window.

Translating Data to an ASCII Text File

Introductions

Project Data must be translated into .CSV 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.

1. Select File from the Main Menu. Select Export.
2. 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.
3. An “Export To...” Window will appear. Type in the name that you would like to call your exported data and click Save.
4. 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.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Location Number													
2	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 4-14. Exported Excel information.

Generating a Plot

Introductions

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.

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 resulting graph will be plotted to the screen (see figure 15 below).

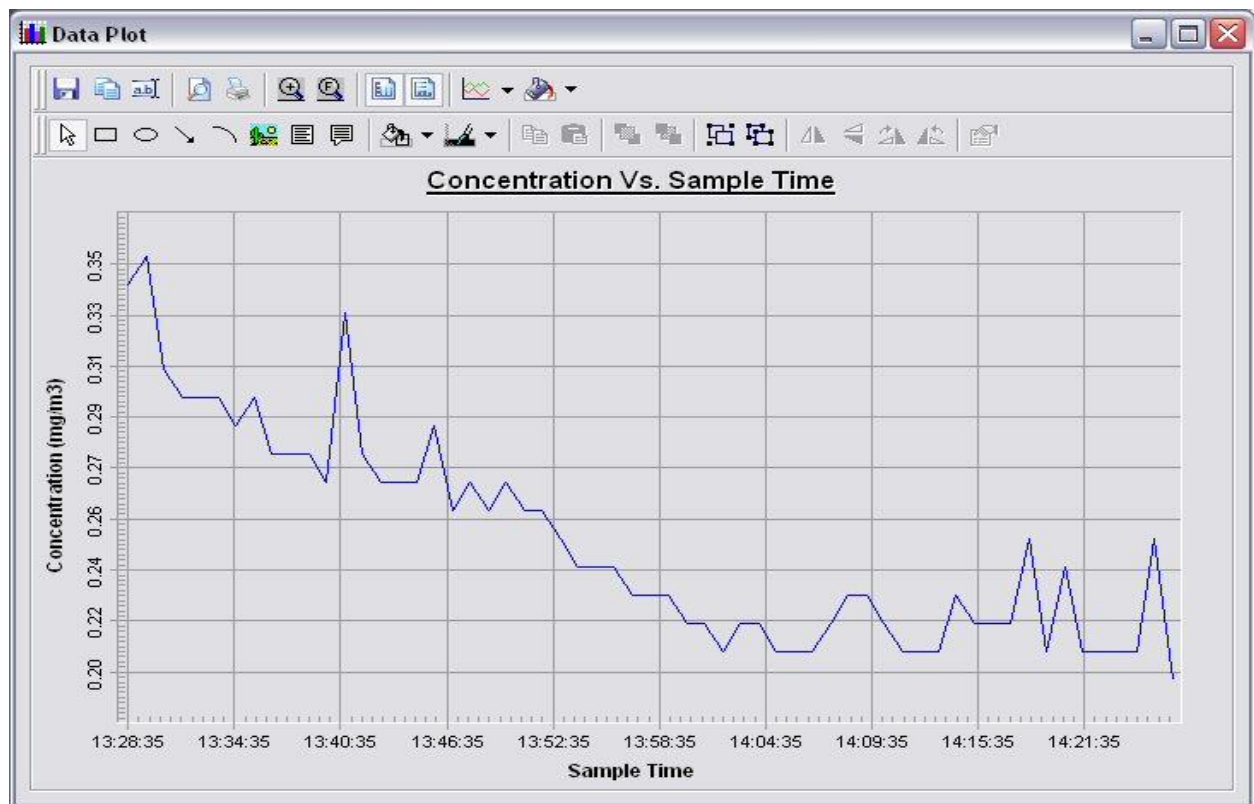
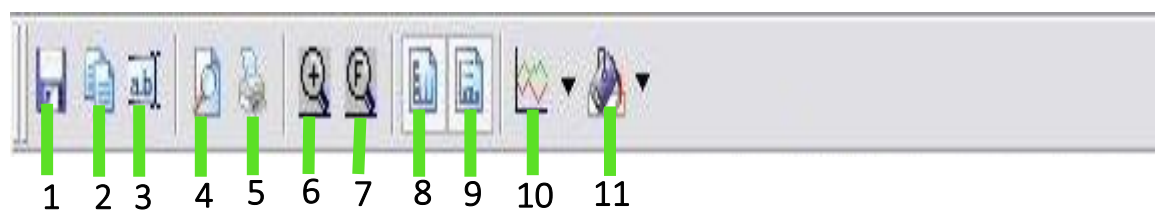


Figure 4-15. Graph generated plotted to screen

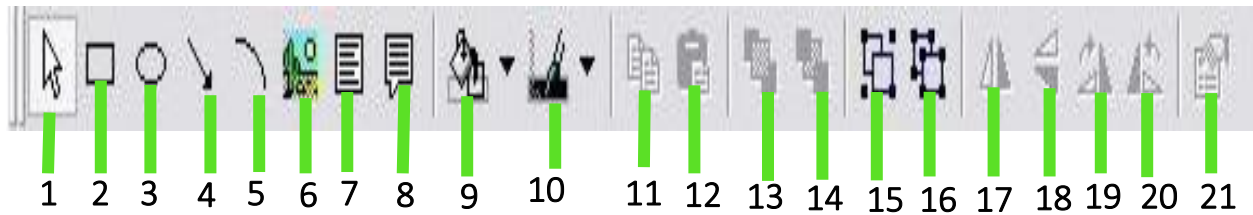
Data Plot Menu Selections

Introductions

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.



Number	Function
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

Introductions

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

Editing the Title

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



Figure 4-16. Edit Title Window.

Applying a Correction Factor

Introductions

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

Calculating a Correction Factor

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

1. Select the 2nd **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. 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.

1. Select the 1st **Scale=** under the Dataset Scale Factor. Data points should return to original state.

Inability to Download Data to PC

Introductions

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

- Ensure that the USB cable is secure into the side of the instrument and the PC.
- Ensure that the communications settings are set appropriately in the Download Properties screen of the DustComm Pro 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 USB cable is secure, your cable may be connected to the incorrect Port on the PC. The DustComm Software allows user to select Comm Ports 1-10. The COM Port selected on the software must match what is selected on the computer. To verify, go in the Device Manager on the computer and see what COM Port you are plugged into. Then match the software to the computer. If the Com Port is greater than 10, the USB cable needs to be removed from the PC and plugged into a different port until ports 1-10 are available and displayed on the device manager.

For service or Technical Questions please call 800-234-2589 or 1-(603)378-2112 or e-mail techsupport@hazdust.com

5. Section Five

Maintenance of the SM-7204

Section 5- Maintenance on SM-7204

Introduction

This chapter covers the maintenance procedures for the SM-7204.

This section contains the following topics.

- Checking the Calibration Span.....Page 80
- Battery Maintenance.....Page 82
- Determining Battery Charge Status..... Page 82
- Charging the Battery..... Page 83
- Cleaning the Sensor Optics.....Page 84

Checking the Calibration Span

Introduction

The SM-7204 offers users the ability to verify the instrument is within +/- 10% of factory calibration when using the Calibration Span Reference accessory (p/n CS-7204). This unique feature allows users to have confidence in taking meaningful data.

The SM-7204 will monitor the scattered light from the infrared emitter and register the light on and off. The high and low need to match in this internal process to pass. If the emitter is not consistent during this process the instrument will fail the calibration span verification.

The calibration span should be checked under the following conditions:

- Once a month with normal usage.
- If the SM-7204 is dropped or otherwise damaged.
- The first time you use the instrument to double check the factory calibration.

Note: The SM-7204 should be sent into EDC annually for recalibration.

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

- The Environment must be relatively clean air
- The Battery must be fully charged.

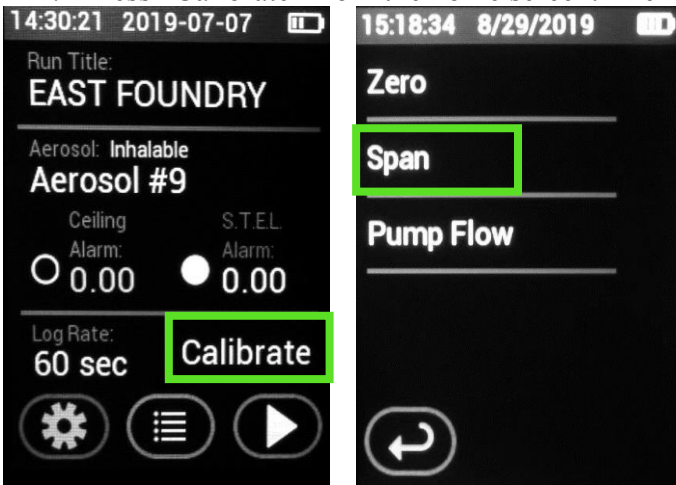
Procedure for Using Calibration Reference

6. Insert the CS-7204 into the sensor as shown in figure below.

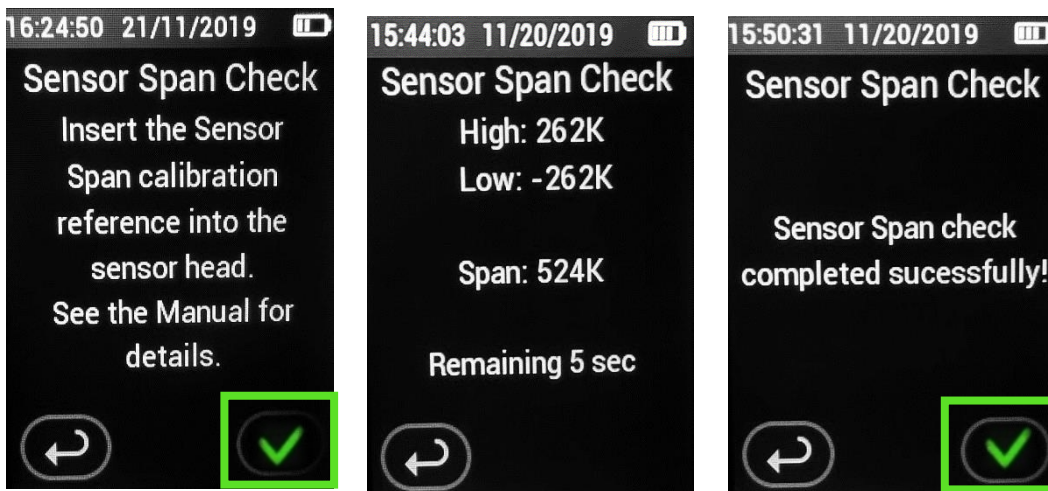


Figure 5-1. CS-7204 being inserted into SM-7204 sensor

7. Press “Calibrate” from the home screen. Then Press “Span”



8. The SM-7204 will then prompt the user to insert the CS-7204.
9. The instrument will then start the verification process and enter the Sensor Span Check screen. The process takes 30 seconds. Once complete the instrument will display a pass or fail.



10. If the instrument passes the Span Check the user must remove the CS-7204 prior to starting the sample run. If the instrument fails the Span Check try again and contact Technical Support for assistance if the instrument fails on the third attempt. The instrument will need to be factory serviced.

Battery Maintenance

Notes and Cautions

Instrument will not sample if the battery status is low.

- Do not operate pump from or charge pump in hazardous locations.
- Power off pump before removing battery to avoid loss of time, date, and other settings.
- Use only the EDC approved battery pack (P/N BP-7204) an unapproved battery and/or could damage the pump and will void any warranty.
- Tampering with the battery pack (opening, disassembling, short circuiting, crushing, or exposing the battery pack to temperatures in excess of 212 F [100 C]) voids any warranty.
- User may replace external components such as the inlet filter, battery, and/or belt clip. Warranty is void if the instrument is opened by user.
- Failure to follow warnings, notes, and cautions voids any warranty.
- CAUTION: The battery used in this device may present a risk of fire or explosion when heated above 212 F (100 C) or incinerated.
- Warning: To prevent ignition of a hazardous atmosphere, batteries must only be changed [removed and replaced] in an area known to be known-hazardous.
- CAUTION: Risk of Fire and Burns. Do Not Disassemble, heat above 212 F (100 C), or incinerate. Keep battery out of reach of children and in original package until ready to use. Dispose of used batteries promptly according to [all state and] local recycling or waste regulations.

Note: To conserve battery power, a non-sampling pump will power off automatically after 5 minutes of inactivity.

Determining Battery Charge Status

The battery status icon at the top right of the Home screen contains four bars that reduce in number as battery charge is depleted. Use the table below to interpret the battery status icon.

Icon Displayed Battery Charge Remaining



Four Bars = Full battery charge 75%-100%



Three Bars= Approximately 50-75%



Two Bars= Approximately 25-50%



Zero Bars= The instrument will enter low battery status and register as a fault. The instrument will eventually shut off. The data will be saved until the instrument stops working. An event will be registered on the data history.

Charging the Battery

Charge the battery under the following conditions using only the supplied and or approved EDC charger.

Note: a fully charged new battery will last 22 hours at 2 LPM without a filter at 70F (21 C).

1. Upon receipt of purchase or service and calibration.
2. The instrument should be charged whenever the status dips below 50% to avoid the instrument shutting off during a sample run.
3. The instrument should be charged every two months when in storage.
4. Whenever being stored in temperatures over 70 F (21 C) or higher as higher temperatures increase the rate of discharge.

There are three lights that will illuminate during the charging process.



Green and Red = Charging



Green and Yellow = Charged

Figure 5-2. Charging lights

Removing the Battery Pack

1. Remove the two screws from the battery pack housing. Wiggle the housing and pull out.
2. The battery is attached to the instrument by a black plastic connector. Depress the latch to release connection. Keep battery in tray. Do not remove battery. The entire battery pack needs to be replaced, or warranty is void.



Figure 5-3. Removing battery pack

Cleaning Sensor Optics

Description:

A dirty optical sensor can affect the readings of the instrument and should be cleaned periodically. **Note:** Cleaning should be performed after every 8.0 hours of use when monitoring in average concentrations of over 1 mg/m³.

- Step 1.** Remove the optical shield that is held in place by the (3) Silver 4/40 Philips screws holding the optical shield to the optical sensor. There are 2 shields, remove **only** the shield opposite the signal cable. Do **not** remove the other shield.
- Step 2.** Observe optical sensor for residue/dust. Using bulb, blow off any residue/dust inside the optical shield and on the optical sensor. Then clean the optical lens with a foam tip swab. **DO NOT** use a cotton swab it will scratch the lens and void warranty.

NOTE: Do not use liquid cleaning solution. Excessive cleaning will damage optical paint & penetrate behind optical lenses and will void warranty.

- Step 3.** Use provided moistened wipe to gently clean external optical sensor and instrument if needed.

- Step 4.** Replace optical shield and screws.

- Step 5.** Re-zero unit.



Figure 5-4. P/N KKB-101

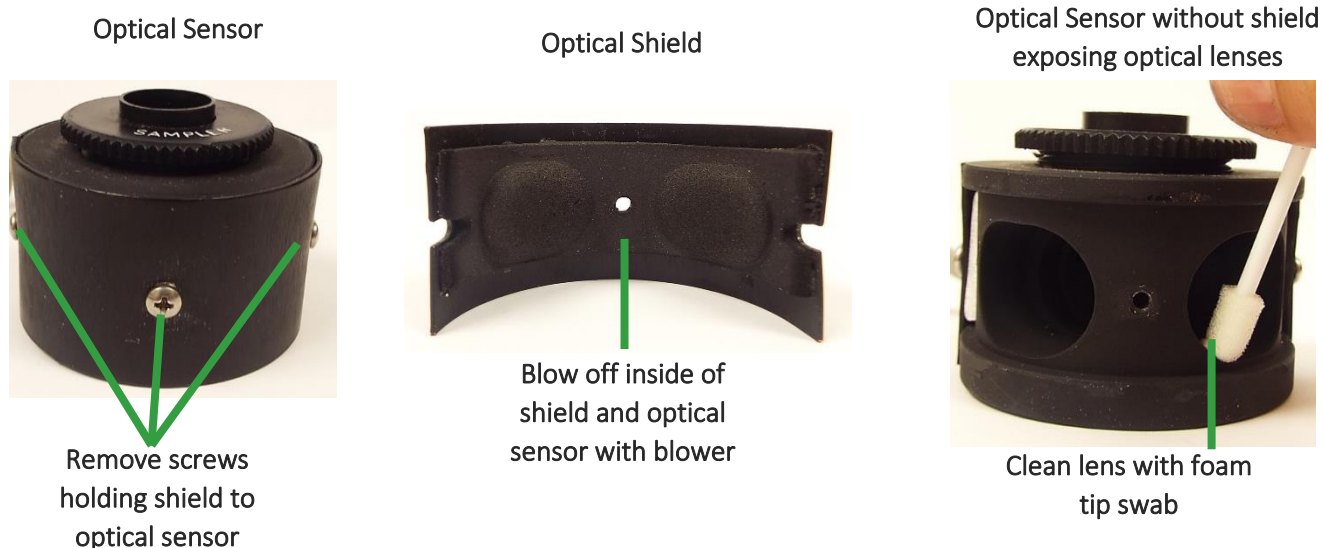


Figure 5-5. Cleaning of optical sensor

Appendix

Appendix A

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	
* Refer to Agency Method				

Dust/Hazard	Agency	Reference	TWA	STEL
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	
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	

Dust/Hazard	Agency	Reference	TWA	STEL
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	
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	*	

Dust/Hazard	Agency	Reference	TWA	STEL
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 B

Introduction

The tables below show the particle size cut point for Thoracic, Inhalable, and Respirable dust particles.

Particle Size Selections

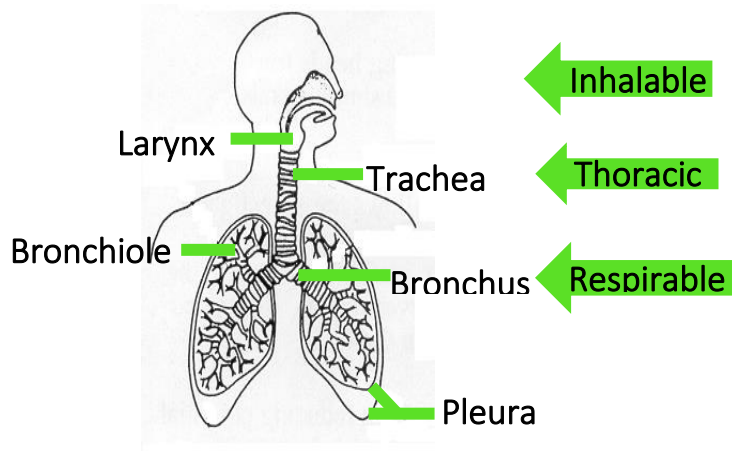
Inhalable	
Particle Aerodynamic Diameter (μm)	Inhalable Particulate Mass (IPM) (%)
0	100
1	97
2	94
5	87
10	77
20	65
30	58
40	54.5
50	52.5
100	50

Respirable	
Particle Aerodynamic Diameter (μm)	Respirable Particulate Mass (RPM) (%)
0	100
1	97
2	91
3	74
4	50
5	30
6	17
7	9
8	5
10	1

Thoracic	
Particle Aerodynamic Diameter (μm)	Thoracic Particulate Mass (TPM) (%)
0	100
2	94
4	89
6	80.5
8	67
10	50*
12	35
14	23
16	15
18	9.5
20	6
25	2

*Same Cut Point as EPA PM-10

Particle Size-Selective



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

Introduction

Accessories may be purchased separately for the SM-7204

Accessory and part number

Accessory	Part Number
Battery Charger	BC-750
Li Ion Battery Pack	BP-750
37 mm Opaque Filter Cassette Blanks	CAS-102
37mm MCE 0.8um filter (pack 50)	EDC-1931A
Calibration Reference	CS-7204
Cleaning Kit	KKB-101
Carrying Case	CC-104
Flow Meter	FM-105
IOM Sensor Inlet	IS-104
Respirable Dust Cyclone Inlet	RS-104
Thoracic Sample Inlet	TS-104
Zeroing Filter	ZF-102
Open Faced Sampling Adapter	17-174