CONTAMINATION CONTROL

Portable Particle Counters

AEROTRAK™ Portable Airborne Particle Counter

Models 9310/9350/9510/9550

Operation Manual

P/N 6002279, Revision A
February 2009

TRUST. SCIENCE. INNOVATION.

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CERTIFIED ISO 9001:2000

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Manual History

The following is a manual history of the AEROTRAK™ Portable Airborne Particle Counter, Models 9310/9350/9510/9550 Operation Manual (P/N 6002279).

Revision	Date
A	February 2009

Warranty

Part Number 6002279/ Revision A / February 2009

Address TSI Incorporated / 500 Cardigan Road / Shoreview, MN 55126 / USA

E-mail Address aerotrak@tsi.com

Limitation of Warranty and Liability
(effective July 2000)

Seller warrants the goods sold hereunder, under normal use and service as described in the operator's manual, shall be free from defects in workmanship and material for (12) months, or the length of time specified in the operator's manual, from the date of shipment to the customer. This warranty period is inclusive of any statutory warranty. This limited warranty is subject to the following exclusions:

a. Hot-wire or hot-film sensors used with research anemometers, and certain other components when indicated in specifications, are warranted for 90 days from the date of shipment.

b. Parts repaired or replaced as a result of repair services are warranted to be free from defects in workmanship and material, under normal use, for 90 days from the date of shipment.

c. Seller does not provide any warranty on finished goods manufactured by others or on any fuses, batteries or other consumable materials. Only the original manufacturer's warranty applies.

d. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, goods which are incorporated into other products or equipment, or which are modified by any person other than Seller.

The foregoing is IN LIEU OF all other warranties and is subject to the LIMITATIONS stated herein. **NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE**.

TO THE EXTENT PERMITTED BY LAW, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF SELLER'S LIABILITY FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES CONCERNING THE GOODS (INCLUDING CLAIMS BASED ON CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) SHALL BE THE RETURN OF GOODS TO SELLER AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF SELLER, THE REPAIR OR REPLACEMENT OF THE GOODS. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING OR REINSTALLATION COSTS OR CHARGES. No Action, regardless of form, may be brought against Seller more than 12 months after a cause of action has accrued. The goods returned under warranty to Seller's factory shall be at Buyer's risk of loss, and will be returned, if at all, at Seller's risk of loss.

Buyer and all users are deemed to have accepted this LIMITATION OF WARRANTY AND LIABILITY, which contains the complete and exclusive limited warranty of Seller. This LIMITATION OF WARRANTY AND LIABILITY may not be amended, modified or its terms waived, except by writing signed by an Officer of Seller.

Service Policy

Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI's Customer Service department at 1-800-874-2811 (USA) or +001 (651) 490-2811 (International).

Trademarks

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Contents

Safety Information

This section gives instructions to promote safe and proper handling of the AEROTRAK™ Portable Airborne Particle Counters.

IMPORTANT
There are no user-serviceable parts inside the instrument. Refer all repair and maintenance to a qualified factory-authorized technician. All maintenance and repair information in this manual is included for use by a qualified factory-authorized technician.

Laser Safety

- These Portable Airborne Particle Counters are Class I laser-based instruments.
- During normal operation, you will ***not*** be exposed to laser radiation.
- Precaution should be taken to avoid exposure to hazardous radiation in the form of intense, focused, visible light.
- Exposure to this light may cause blindness.

Take these precautions:

- ***DO NOT*** remove any parts from the particle counter unless you are specifically told to do so in this manual.
- ***DO NOT*** remove the housing or covers. There are no user-serviceable components inside the housing.

WARNING
The use of controls, adjustments, or procedures other than those specified in this manual may result in exposure to hazardous optical radiation.

Labels

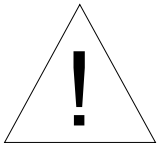
Advisory labels and identification labels are attached to the outside of the particle counter housing and to the optics housing on the inside of the instrument.

1. Serial Number Label (back panel)	
2. Laser Radiation Label (internal)	**DANGER!** VISIBLE LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO BEAM WARNING: NO USER SERVICABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL
3. Electrical Shock caution and no user serviceable parts (*back panel*)	**CAUTION** No user serviceable parts inside. Refer service to qualified personnel. To avoid electrical shock, the power cord protective grounding conductor must be connected to earth ground
4 Laser Instrument compliance label (*back panel*)	**Class 1 Laser Product** This product is in complete compliance with 21 CFR 1040, 10 and 1040, 11
5. AC Power Label (*back panel*)	AC Power In 100-240 VAC 50-60 Hz, 1.0A Max
6. European symbol for non-disposable item. Item must be recycled.	

Description of Caution/Warning Symbols

Appropriate caution/warning statements are used throughout the manual and on the instrument that require you to take cautionary measures when working with the instrument.

Caution



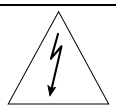
Caution
Failure to follow the procedures prescribed in this manual might result in irreparable equipment damage. Important information about the operation and maintenance of this instrument is included in this manual.

Warning

WARNING
Warning means that unsafe use of the instrument could result in serious injury to you or cause damage to the instrument. Follow the procedures prescribed.

Caution or Warning Symbols

The following symbols may accompany cautions and warnings to indicate the nature and consequences of hazards:

	Warns that uninsulated voltage within the instrument may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make contact with any part inside the instrument.
	Warns that the instrument contains a laser and that important information about its safe operation and maintenance is included in the manual.
	Warns that the instrument is susceptible to electro-static dissipation (ESD) and ESD protection procedures should be followed to avoid damage.
	Indicates the connector is connected to earth ground and cabinet ground.

Getting Help

To obtain assistance with this product or to submit suggestions, please contact Customer Service:

TSI Incorporated
500 Cardigan Road
Shoreview, MN 55126 U.S.A.
Fax: (651) 490-3824 (USA)
Fax: 001 651 490 3824 (International)
Telephone: 1-800-874-2811 (USA) or (651) 490-2811
International: 001 651 490 2811
E-mail Address: aerotrak@tsi.com
Web site: www.tsi.com

CHAPTER 1

Introduction and Unpacking

The AEROTRAK™ Portable Airborne Particle Counters (particle counter) have a touch-screen interface and operate on the included lithium-ion battery or AC power.

These devices have either a 1.0 CFM (28.3 L/min) flow rate or a 50 L/min (1.77 CFM) flow rate and count bin sizes from 0.3 to 10 µm depending on the model ordered (see table below). Up to 10,000 data sets can be downloaded for analysis and reporting using the TRAKPRO™ Lite Data Download Software included with the device. Each model is also available with an "N" suffix to indicate a "No Printer" option.

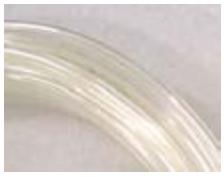
Model	Size Range	Flow Rate
9310-01	0.3, 0.5, 1.0, 3.0, 5.0, 10.0 µm	28.3 L/min (1 CFM)
9510-01	0.5, 0.7, 1.0, 3.0, 5.0, 10.0 µm	28.3 L/min (1 CFM)
9350-01	0.3, 0.5, 1.0, 2.0, 3.0, 5.0 µm	50 L/min (1.77 CFM)
9550-01	0.5, 0.7, 1.0, 3.0, 5.0, 10.0 µm	50 L/min (1.77 CFM)

Typical applications for these particle counters include cleanroom monitoring, research, exposure assessment, indoor air quality, filter testing, clearance testing, quality assurance, and contaminant migration studies. All AEROTRAK™ particle counters meet JIS standards.

Unpacking the AEROTRAK™ Airborne Particle Counter

Carefully unpack the AEROTRAK™ Airborne Particle Counter from the shipping container and verify that all the items shown in the photos below and listed in the following tables are present. Contact TSI immediately if items are missing or broken (see Chapter 7, Contacting Customer Service for more information).

AEROTRAK™ Airborne Particle Counter Parts List

Qty.	Item Description	Part/Model	Reference Picture
1	AEROTRAK Airborne Particle Counter	9310-01 9510-01 9350-01 9550-01	
1	Barb Inlet Fitting (installed)	700014 (1 cfm) 700061 (50 L/min)	
1	Power Cord	700057 (US) 700058 (UK) 700059 (Euro)	
1	Battery pack	700028	
1	Tripod for isokinetic probe	3000192	
3 m (10 ft)	Sample Tubing (1 cfm – 1/4 ID x 3/8 OD for 9310/9510, 50 L/min – 3/8 ID x 1/2 OD for 9350/9550)	700011 (1 cfm) 700062 (50 L/min)	
1	Isokinetic Probe (barbed for tubing) • 1 cfm Aluminum for 9310/9510 • 50 L/min Stainless Steel for 9350/9550	700016 (1 cfm) 700026 (50 L/min)	
1	Computer cable (2 m), USB A to B	700033	

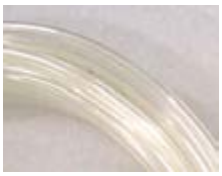
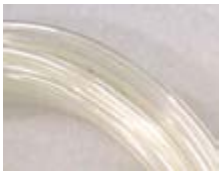
Qty.	Item Description	Part/Model	Reference Picture
1	Stylus	N/A	
1	HEPA zero filter assembly	700015	
1	TRAKPRO™ Lite data download utility CD (includes manual)	7001384	
1	Operation Manual	6002278	(installed on TrakPro Lite CD)
1	Calibration certificate	N/A	
1	Quick Start Guide	6002240	

Optional Accessories

The following photos and table list optional accessories. If you ordered optional accessories, make certain they have been received and are in working order.

Model 9310/9350/9510/9550 AEROTRAK™ Airborne Particle Counter Optional Accessories

Item Description	Part/Model	Reference Picture
Stainless Steel Isokinetic Probe (used with tubing)	700017 (SS 1 cfm for 9310/9510)	
Stainless Steel Isokinetic Inlet (1 cfm)	700018	

Item Description	Part/Model	Reference Picture
Stainless Steel Isokinetic Inlet (50 L/min)	700035	
Tubing, Superthane 1/4-inch ID x 3/8-inch OD, Clear 100 ft	700011	
Tubing, Superthane 3/8-inch ID x 1/2-inch OD, Clear 100 ft	700062	
Printer paper (10 rolls)	700027	
Dual Battery Charger	700029	
Carry Case	700030	
Heavy Duty Carry Case (rolling case)	700060	

CHAPTER 2

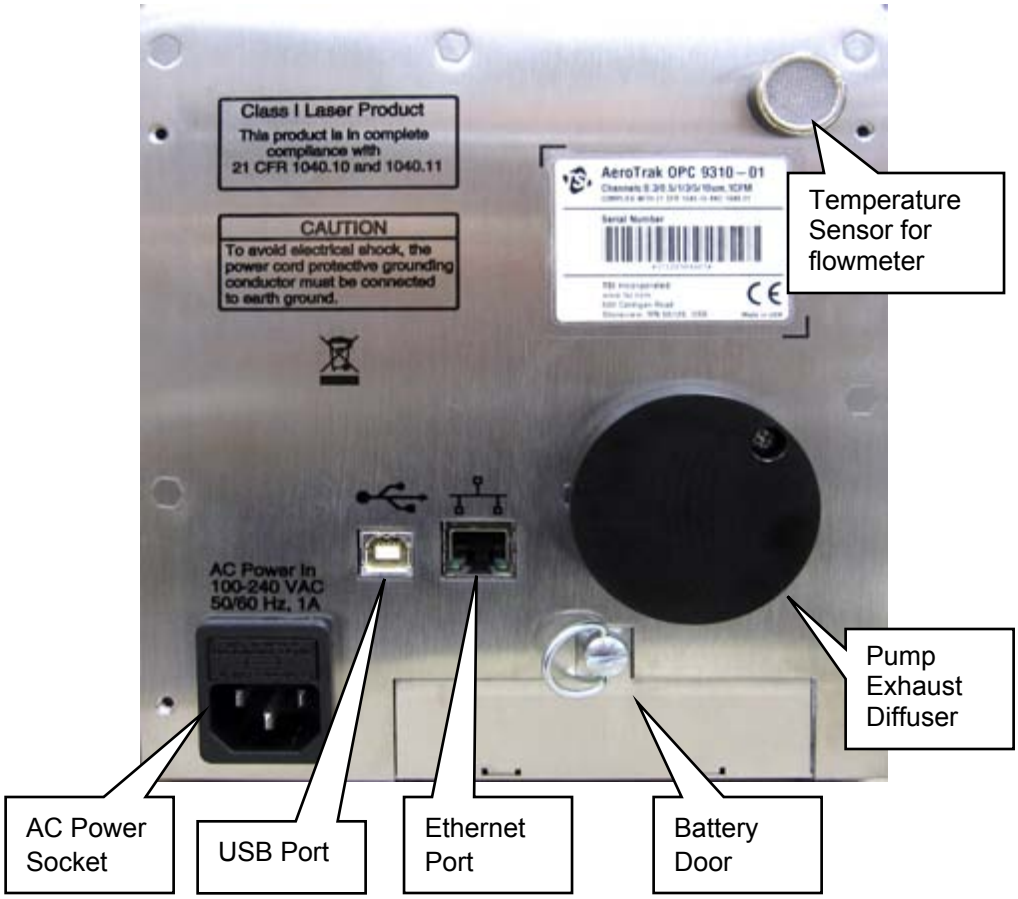
Getting Started

This chapter describes the features, connections, and installation and of the AEROTRAK™ Portable Airborne Particle Counter (particle counter). It includes:

Instrument Description

The AEROTRAK™ Portable Airborne Particle Counter has many features to make measurements convenient. The power switch is located on the front panel in the lower-left. A power LED indicates when the instrument is powered up. The main interface for the user is the color touch-screen interface on the front (see the note below on using a stylus with the screen). The sample inlet is located on the top of the instrument. A barbed inlet is normally installed, but an isokinetic inlet is also available. A large handle is also located on top to carry the instrument. On the left side of the instrument is a built-in printer.

The back of the instrument has a temperature sensor to compensate the built-in mass flowmeter. This provides more accurate flow control. On the lower left is the AC power socket for an AC power cord, a USB port, an Ethernet Port, the battery door which provides access to the rechargeable battery. Also on the back panel is the pump exhaust diffuser. It is the outlet for sampled air. The air is HEPA filtered before it is exhausted to the room. The back panel also has warning labels and model and serial number information.

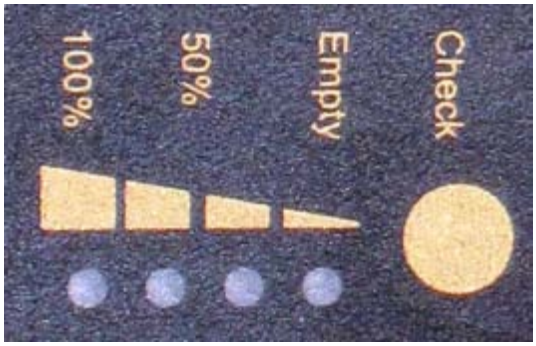


Providing Power

These particle counters may be powered using a rechargeable lithium-ion battery or through an AC power cord.

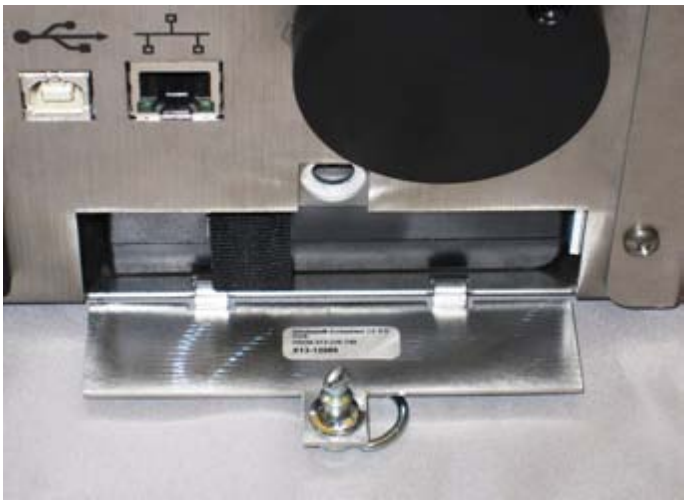
Notes:

- When using AC power, the battery (if installed) charges when the instrument is on, but not while actively sampling.
- Removing/changing the lithium-ion battery or disconnecting AC power does not cause loss of data. The AEROTRAK™ Airborne Particle Counter has an internal, non-user accessible battery to maintain settings and save logged data.
- Note that the battery provided has a built-in indicator of charge level. Push on the “Check” button to see the charge level. If none of the LEDs lights up, the battery is not charged.



To Install the Lithium-Ion Battery

1. Remove the battery door on the back of the instrument by turning the thumbscrew ¼ turn counterclockwise.



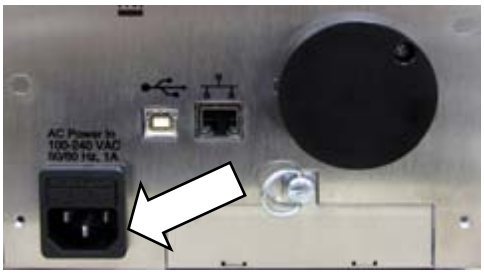
2. Slide the battery into the slot, pressing until it “clicks” into place (note that battery is approximately ¼-inch or 6-mm inside the back cover when properly installed.)
3. Close the battery door and lock the latch with a ¼ turn clockwise.

W A R N I N G
The battery supplied by TSI (PN 1208057) has built in protection against explosion and fire hazard. Do ***not*** use a substitute.

W A R N I N G
Do ***not*** use non-rechargeable batteries in this instrument. Fire, explosions, or other hazards may result.

To Use AC Power

Connect the country-appropriate power cord to the AC socket of the particle counter and then connect the other end to an AC outlet.



Using the Stylus

These particle counters are shipped with a plastic stylus for use with the touch screen interface. Use your fingertip or the stylus only. Do ***not*** use sharp objects, such as pens or pencils, on the touch screen as they may damage it.

Using the Integral Thermal Printer

The integral thermal printer is available as a standard on most models to print manually, automatically after each test is completed, or whenever the alarm function is activated (see Print Settings Screen and Print Schedule Screen on the System Setup Screen).

Printer paper has a colored strip printed on the last few feet of each roll to indicate time to change the paper roll.

When installing a new roll of paper, the tag end should be from the bottom of the roll and pulled through the printer door. There is also a button to allow a manual feed of the paper before tearing it off. To tear off, pull steadily down on the paper from one side of the serrated edge to the other.

The printer has a feed  and stop  button as well as an LED indicating that the printer is ready. The feed button can be held down at the end of a print to allow enough space to tear off the paper. If you unintentionally start a print (especially something very long), you can stop printing with the stop button.

Performing a Zero Check

A zero check should be performed according to application requirements. It should also be performed before conducting any important testing or certification.

To Perform a Zero Check

1. Turn on the instrument and wait until the main menu appears.
2. Unscrew the Isokinetic inlet if attached. The zero check cannot be performed when the isokinetic inlet is attached to the instrument.
3. Screw the zero filter assembly on to the threaded inlet located on the top of the instrument.

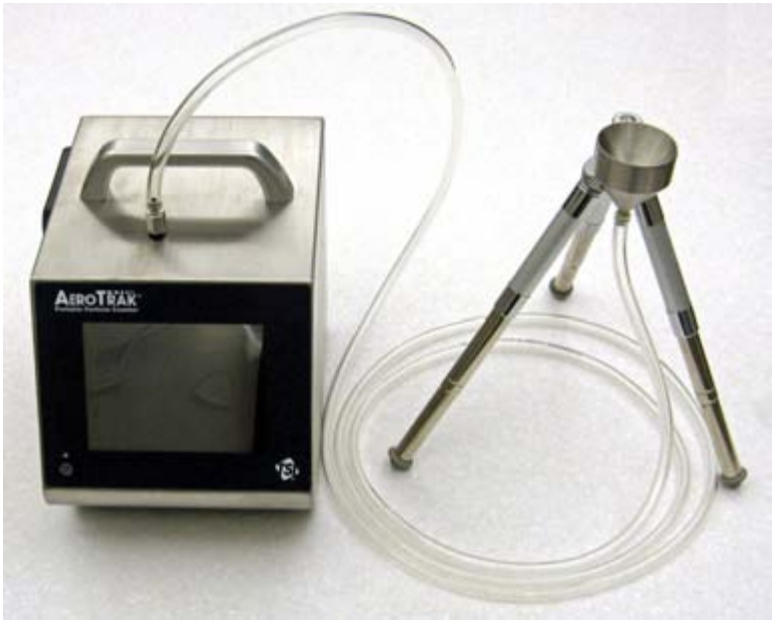
4. Press the  button and allow the instrument to purge for 2 minutes.
5. After the 2-minute purge, continue to sample. In accordance with JIS standards, there should be no more than 1 particle counted at any size in 5 minutes.

***Note**: If the instrument does not go to zero (1 particle in 5 minutes is considered zero), refer to Chapter 6, Troubleshooting, for additional information.*

6. Remove the zero filter assembly and put the isokinetic inlet back on the instrument is now ready for operation.

Using an Isokinetic Probe

The isokinetic probe smoothly accelerates air into the inlet of the instrument. The barbed isokinetic probe can be used with tubing and an adjustable tripod mount to monitor particles in hard to reach places or that are flowing horizontally.



Sampling with Isokinetic Probe and Adjustable Tripod Mount

Using an Isokinetic Inlet

The isokinetic inlet is similar to the isokinetic probe but it mounts directly on the instrument inlet. To install, remove the barbed inlet by unscrewing and simply thread the inlet directly onto the threaded inlet until finger tight. The inlet seals over an O-ring so it doesn't have to be very tight to seal.

Sampling with Optional Isokinetic Inlet

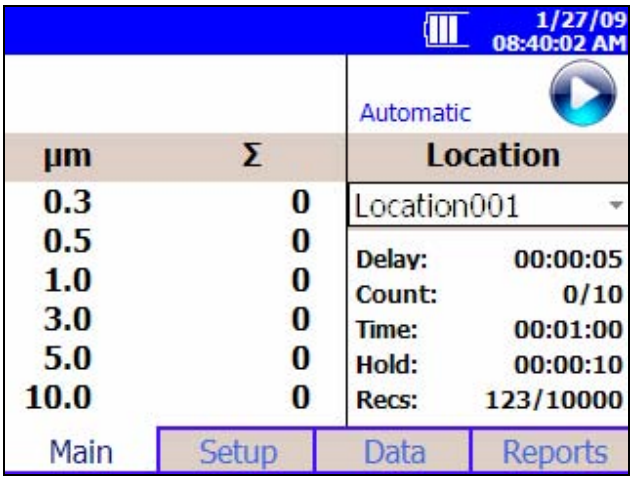
CHAPTER 3

Operation

These AEROTRAK™ Portable Airborne Particle Counters are controlled using a touch screen display. Use the plastic stylus or your finger tip. **DO NOT** use sharp objects (such as a pen point) that may damage the screen overlay.

To turn on the instrument, press the power switch  . After a splash screen displays the TSI logo, a brief start-up sequence begins as the Windows® CE operating system boots up.

The instrument is ready for operation when the Main tab (shown below) appears.



Screen Layout and Functionality

There are four main screens (tabs): Main, Setup, Data, and Reports. The operation of each of these screens, the information displayed on them, and the operations you can perform from each are described in the remainder of this chapter.

Some screens require or allow you to enter information. To enter information, tap on the screen and an on-screen keyboard appears.

Software Input Panel (Keyboard)

Throughout the setup screens, a keyboard will appear on the screen when text may be entered. Data may be entered using this keyboard. When the entry is complete, press either the ↵ (**Enter**) or **Esc** keys. The keyboard will then be hidden until another text entry box is selected.

Main Tab

The Main Tab is the default screen. The left side of the screen summarizes the counts or concentrations for the currently selected location. Tap on the left side of the screen to enable Zoom (see Setup Tab).

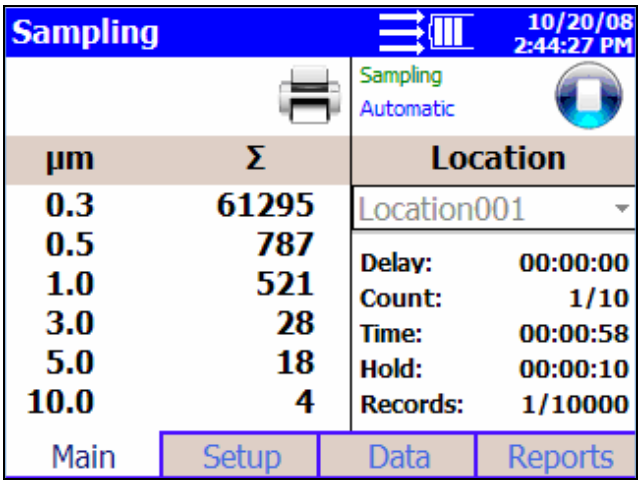
The display shows:

- Bin sizes
- Particle count/concentration

The status bar at the top of the screen shows the current time and date (see the Setup Tab) and indicates:

Icon	Description
	Laser or Detector requires service
	Sufficient flow through the instrument
	Insufficient flow through the instrument
	Operating on AC power, no battery installed
	Operating on AC power, battery is installed and charging
	Battery charged
	Low battery
	Battery must be charged

The right side of the Main Tab shows locations and other information (delay, counts, and so on). These can be configured using the Setup Tab.



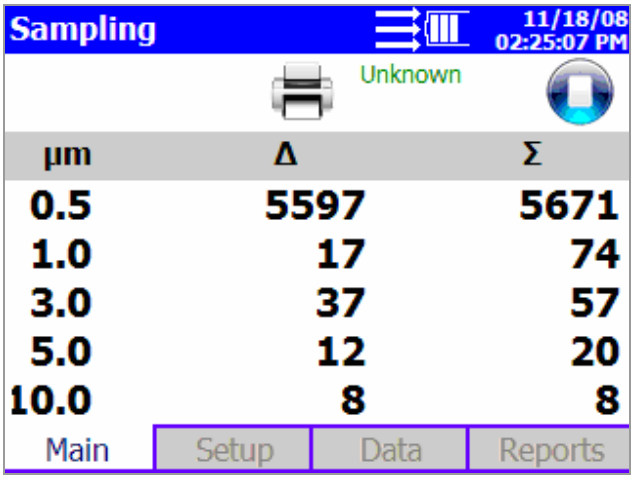
Field	Description
Location	Use this dropdown box to select any of the available locations. The Location setting cannot be changed during an active sampling period, but if you have configured a Hold time, the location can be changed during the Hold period between samples.
Delay	The initial delay between the time the Start button is pressed and the instrument begins sampling.
Count	The number of samples that have been taken/the total number of samples configured for the run. If Count is set to 0 (continuous sampling), then only the number of samples since the run start are shown. This field is only meaningful in Automatic mode.
Time	The time for each sample.
Hold	The time between samples. This field is only meaningful in Automatic mode.
Records	The database index of the sample currently being displayed/10000 (maximum number of records).
Manual/Automatic/Beep	Mode Indicator refers to the “Data Count Mode” (see section below).
	Press the Start/Stop button to begin sampling in the configured mode.

Zoomed Data Screen

The Zoomed Data screen is entered by touching in the size and count part of the main tab display. The bottom portion of the screen summarizes the concentrations for the currently selected location. Tap the size and count portion of the display to switch back to the Main Tab display.

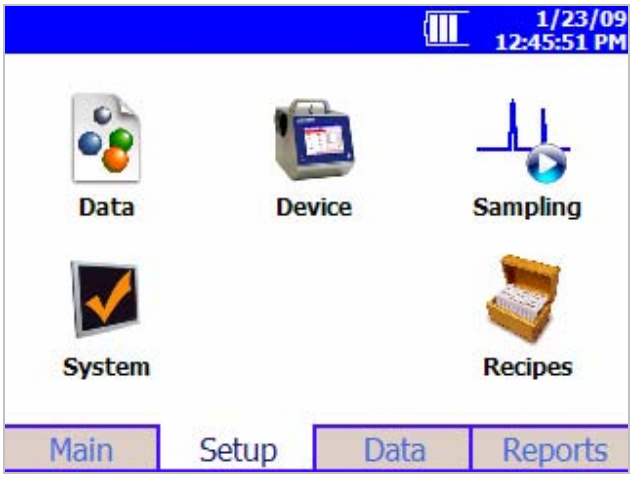
The display shows:

- Bin sizes
- Particle count/concentration



Field	Description
	Prints the current sample to the optional printer.
Location	Label that displays information about the currently selected location.
	Press the Start/Stop button the begin sampling in the configured mode.

Setup Tab

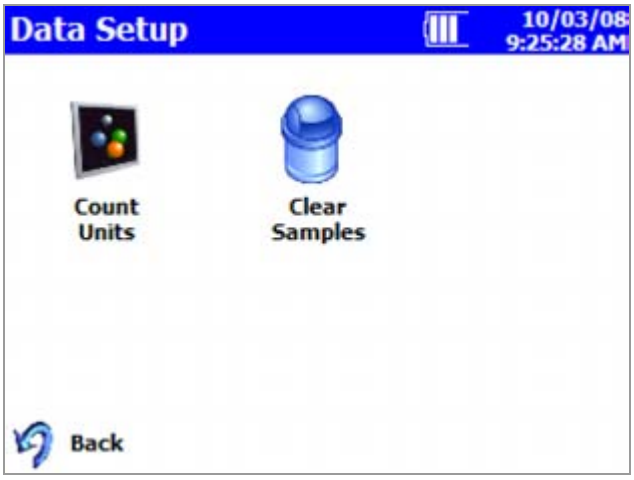


The setup tab provides access to the following:

Data Setup	Select Count Units and Clear Samples.
System Setup	Set Power On Password, Setup Password, System Configuration, Print Settings, and Print Schedule.
Device Setup	Set Display, Date and Time, Diagnostics and Communications.
Sampling Setup	Set up Particle Channels, Sample Timing, Sample Count Mode, Locations, and Particle Channel Alarms.
Recipes	Save a group of settings (recipes) that you use over and over so you don't have to reset individual settings manually.

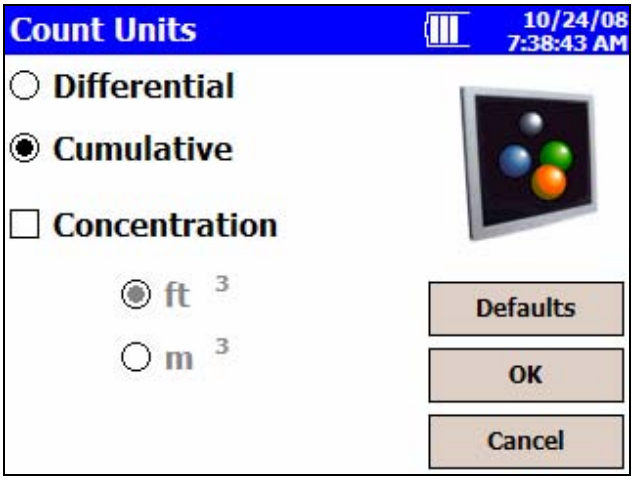
Data Setup Screen

This screen lets you access the Count Units screen and the Clear Samples screen.



Count Units Screen

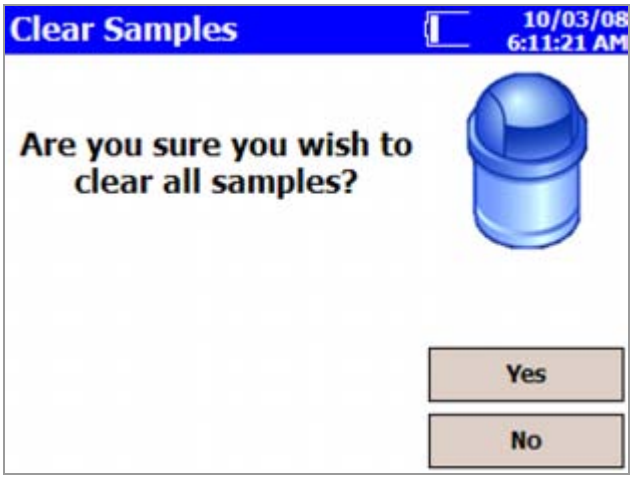
This screen lets you set the way in which particle concentration information is displayed.



Field	Description
Differential	Select to display particle concentration as a differential Δ (the total number of counts is the number of particles *between* bin sizes).
Cumulative	Select to display particle concentration as cumulative Σ (the total number of counts includes all particles larger than the bin size).
Concentration	Display concentration in ft^3 or m^3.

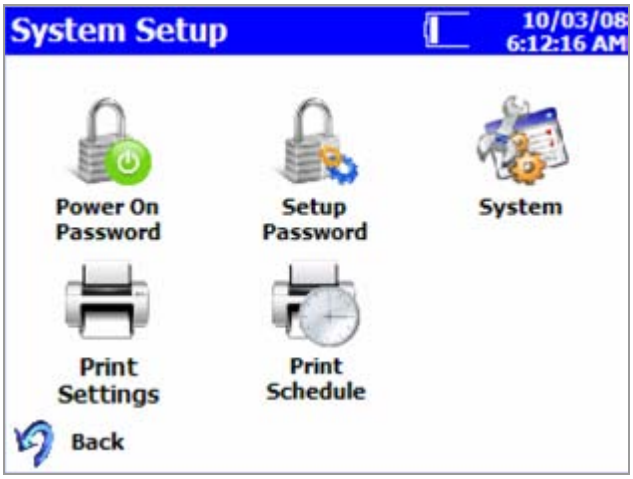
Clear Samples Screen

The Clear Samples screen lets you clear all samples from the internal database. Select **Yes** to clear all samples. Select **No** to return to the Data Setup screen.



System Setup Screen

From the System Setup screen you can set (or change) the Power On password and Setup Password, select system configuration parameters, select print settings, and schedule printing.



(continued on next page)

Change Power On Password Screen

If a Power On password has been previously set, you must enter that password before being allowed to change the Power On password. If a Power On password is set, then on instrument startup, a password screen will ask for the password before the instrument can be used. A blank password is regarded as no password and if set as the new password, will not prompt you for a password on system startup.

Note
Keep the password in a safe place. It is difficult to reset the password and requires contacting the factory. If you have misplaced the password, please contact TSI technical support.

Tap on the screen to display the on-screen keyboard and enter the required information.

Field	Description
Old Password	Enter your existing password (if one has already been set).
New Password	Enter a new password. The password can be any length and use any characters.
Confirm New Password	Retype the new password then press **OK**. A confirmation message appears if the password is changed.

Change Setup Password Screen

If a Setup password has been previously set, you must enter that password before being allowed to change the Setup password. If a Setup password is set, clicking on the setup tab at the bottom of the main screen brings up a password screen. That password must be entered in order to change instrument settings.

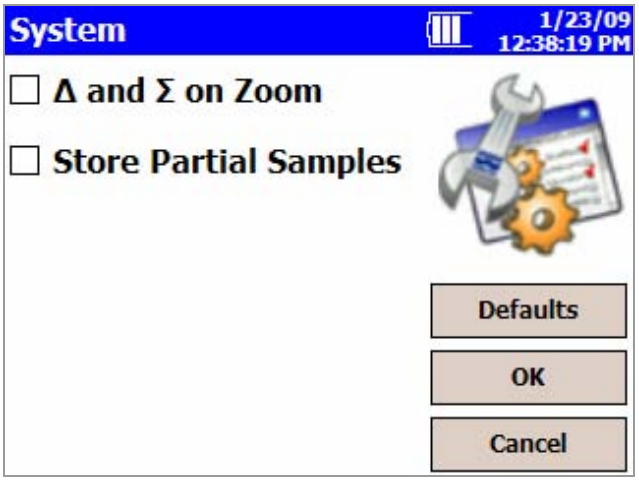
Tap on the screen to display the on-screen keyboard end enter the required information.

Field	Description
Old Password	Enter your existing password. (if one has already been set).
New Password	Enter a new password The password can be any length and use any characters.
Confirm New Password	Retype the new password then press **OK**. A confirmation message appears if the password is changed.

N o t e
Entering a blank password will turn off password protection.

System Configuration Screen

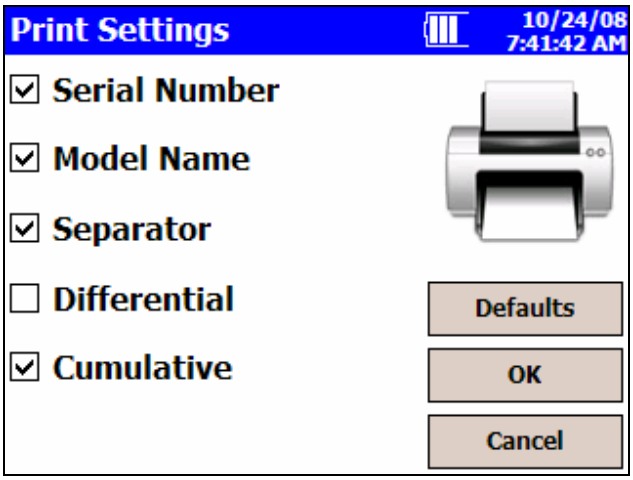
Use this screen to set system configuration parameters. Press **OK** when finished.



Field	Description
Δ and Σ on Zoom	Select to zoom in on both cumulative (Σ) and differential (Δ) counts on the Main Tab. To zoom the Main Tab, click on the left side of the Main Tab. Click on the screen again to return to normal view.
Store Partial Samples	When selected, if sampling is stopped by the user during a configured sampling period by pressing the Start/Stop button, the record will be stored in the instrument's database. When not selected (default), partial samples will be discarded.

Print Settings Screen

A hard copy of a sample set or statistics can be printed from the instrument using the built-in thermal printer that is standard on most models. Use this screen to set print parameters. Press **OK** when finished.

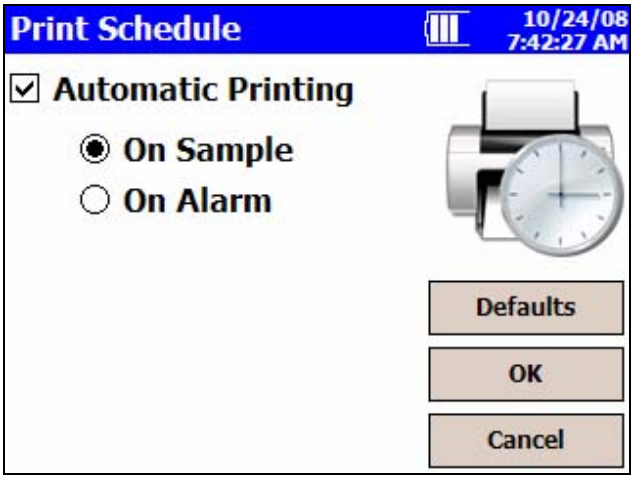


Field	Description
Serial Number	Indicates that the serial number of the particle counter used to collect the data will be printed.
Model Name	Indicates that the model number of the particle counter used to collect the data will be printed.
Separator	Indicates a line separator will be printed after the Model Name and Serial Number in the header of all printouts
Differential	Indicates that the differential value of the data will be printed.
Cumulative	Indicates that the cumulative value of the data will be printed.

Note: *Printer paper has a colored strip printed on the last few feet of each roll to indicate when it is time to change the paper roll.*

Print Schedule Screen

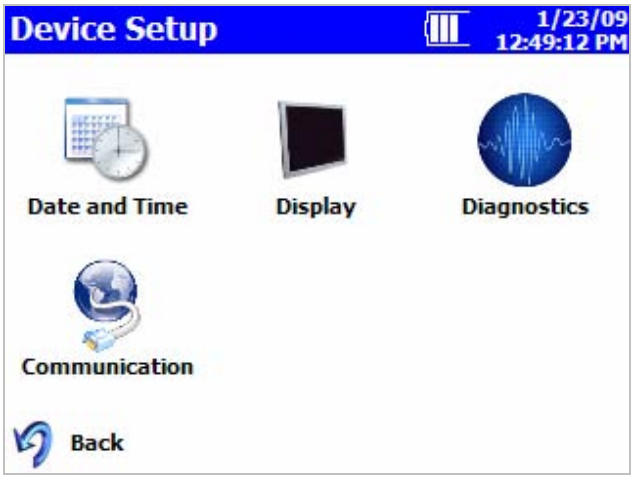
Use this screen to schedule automatic printing. You can choose to either print when an alarm occurs or print whenever a sample is complete.



Field	Description
Automatic Printing	Enables automatic printing.
On Sample	Print data whenever a sample completes.
On Alarm	Print data when an alarm condition occurs.

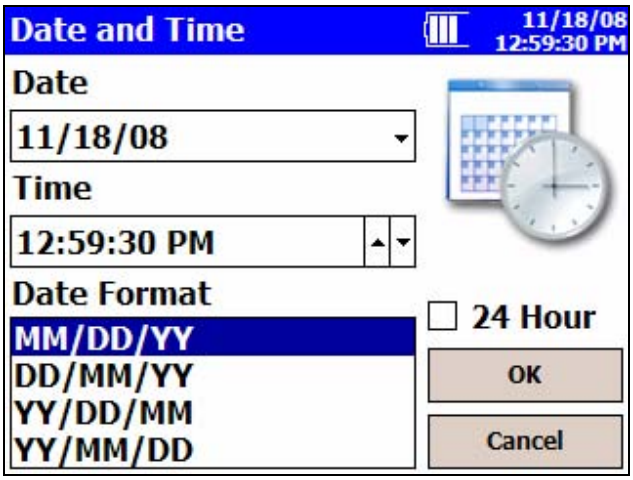
Device Setup Screen

Use this screen to access screens that let you set or change the date and time, adjust display settings, and display diagnostic information.



Date and Time Screen

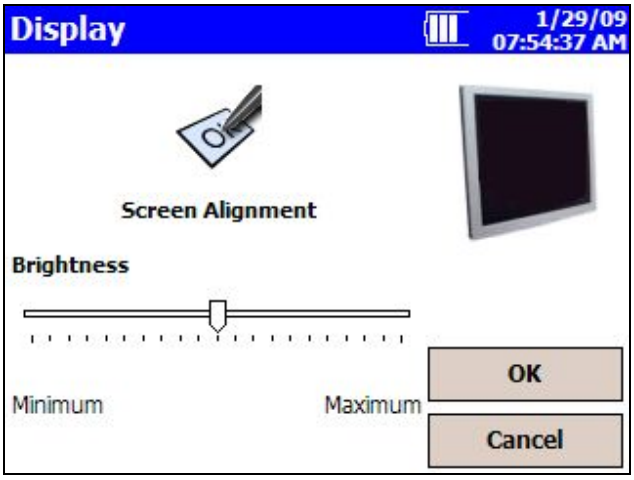
This screen lets you set the current date and time and set the date format that will be used on the display and in printed reports. Press **OK** when finished. You can select options using the arrows or tapping on the screen.



Field	Description
Date	Press the down arrow to display a calendar then select the date from the calendar.
Time	Select the time component you want to change (hours; minutes; seconds) and then use the left and right arrows to adjust to the current time.
Date Format	Highlight the date format you want to use from the list.
24 Hour	Time display is in 24 hour format.

Display Screen

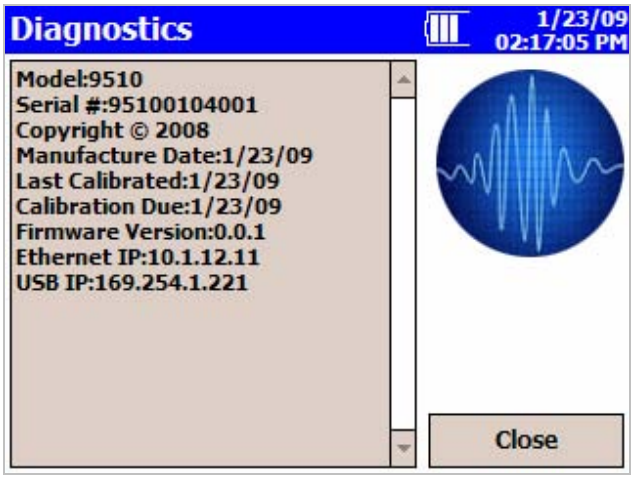
This screen lets you set or change visual parameters



Field	Description
Screen Alignment 	Press this item to reset the screen alignment, and follow the directions on the alignment screen.
Brightness	Use the scroll bar to change the brightness setting for optimal viewing.

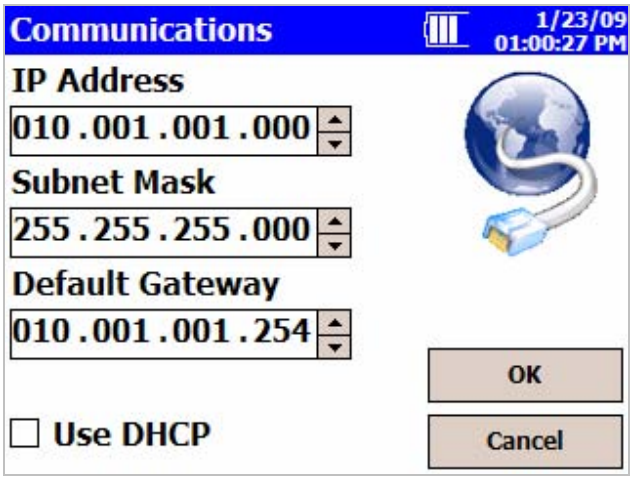
Diagnostics Screen

This screen lets you view the system's model, serial number, copyright, manufacture date, calibration date, next calibration date, firmware version, Ethernet IP address, and USB IP address. Press **Close** when finished.



Communications Screen

This screen lets you configure the instruments Ethernet TCP/IP network communications.

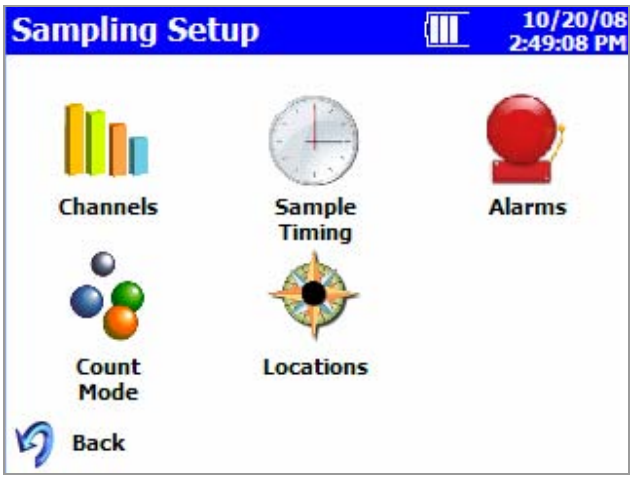


Field	Description
IP Address	The numerical identification (logical address) that is assigned to this device when participating in a computer network utilizing the Internet Protocol for communication between its nodes.
Subnet Mask	A network of computers and devices that have a common, designated IP address routing prefix. All hosts within a subnet can be reached in one "hop" (time to live = 1), implying that all hosts in a subnet are connected to the same link
Default Gateway	A node on the computer network that serves as an access point to another network and is chosen when the IP address does not belong to any other entities in the Routing Table.
Use DHCP (Dynamic Host Configuration Protocol)	When checked, this protocol is used to automatically obtain the information necessary for operation from a DHCP server running on your local network.

N o t e
TCP/IP is an industry standard networking protocol that allows computers and devices to communicate over Ethernet and other media access channels. Providing full details on how to configure an IP network is beyond the scope of this manual. Please contact your company IT department or a qualified networking professional if you are not qualified to configure such a network yourself.

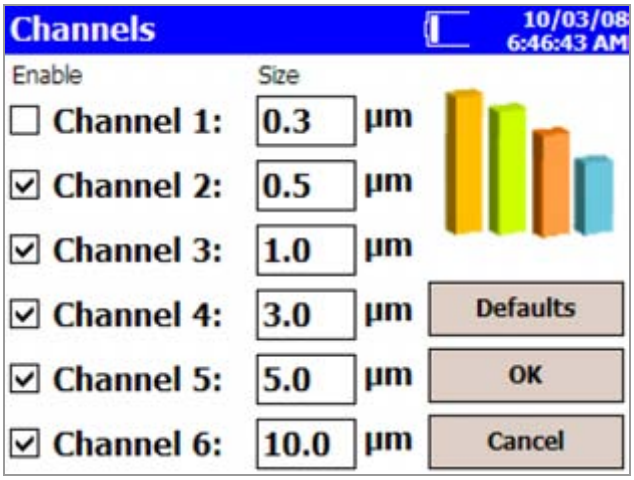
Sampling Screen

Use this screen to access screens that let you set up how sampling is displayed and handled. You can select which channels to use, the sample timing, the count mode, sampling locations, and alarm thresholds.



Channels Screen

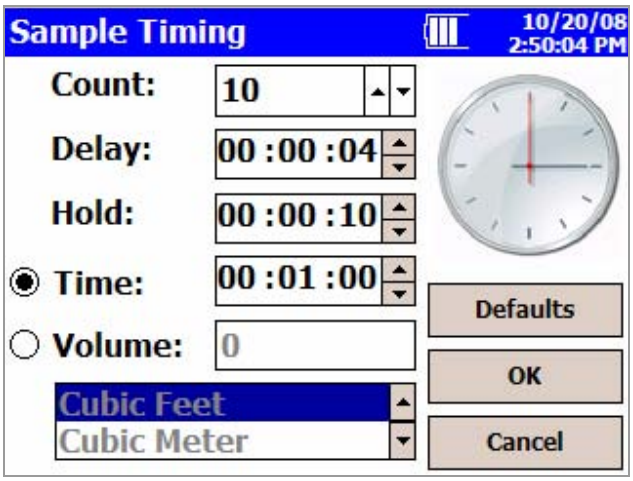
This screen lets you choose the channels that are enabled and set their particle size. Press **OK** when finished.



Field	Description
Enable	Select the channels you want to view on the main display.
Size	These fields display the preset bin sizes for each channel.

Sample Timing Screen

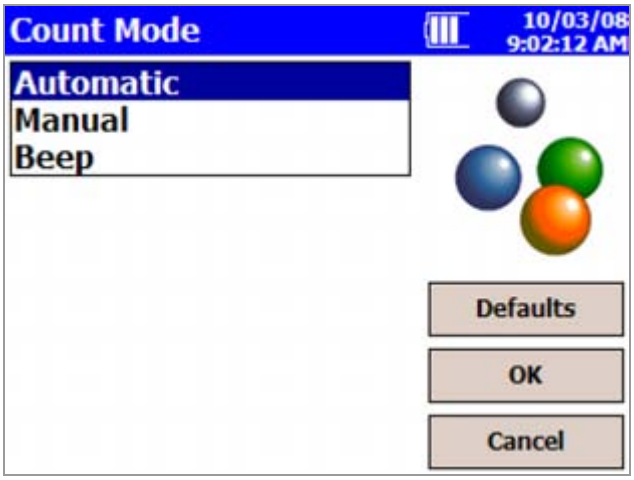
This screen lets you select parameters for sampling. Use the up and down arrows or the on-screen keyboard to change or enter information. These parameters are only valid when the instrument is running in Automatic mode. Press **OK** when finished.



Field	Description
Count	Count is the total number of samples you want collected. In Automatic mode, a Count value of 0 will cause the instrument to count continuously using the settings for Delay, Time, and Hold until the Start/Stop button is pressed again. Use the up and down arrows or the on-screen keyboard to set the count.
Delay	Delay indicates how long it will be before the first sample is taken. Remember, it takes approximately 6 seconds for the pump to reach the flow set point; taking a measurement before the pump is functioning properly may result in a data error. Highlight the time component you want to change (hours, minutes, seconds) and use the up and down arrows or the on-screen keyboard to change the value.
Hold	Hold indicates how long the instrument pauses between samples. Highlight the time component you want to change (hours, minutes, seconds) and use the up and down arrows or the on-screen keyboard to change the value.
Time	Time indicates the duration of each sample run (count particles). Highlight the time component you want to change (hours, minutes, seconds) and use the up and down arrows or the on-screen keyboard to change the value.
Volume	Volume sets the volume of air that will pass through the instrument for each sample. If you select volume, you must select Cubic Feet, Cubic Meters, or Liters for measurement. The sample timing resolution is one second, so you may notice that the device recalculates the volumes you enter to be accurate within the 1-second resolution.

Count Mode Screen

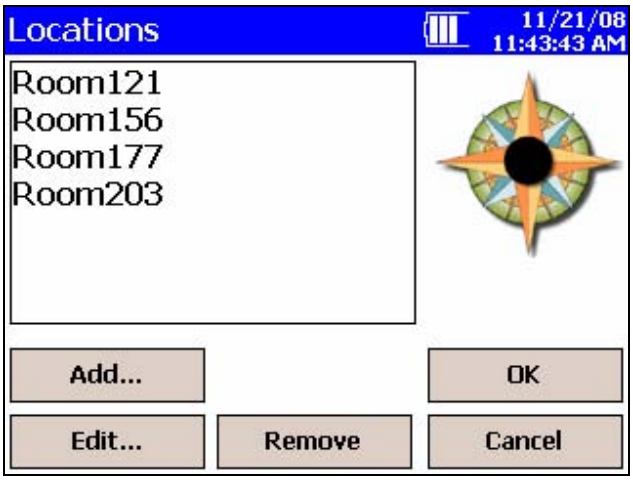
Use this screen to set the sample count mode. Press **OK** when finished.



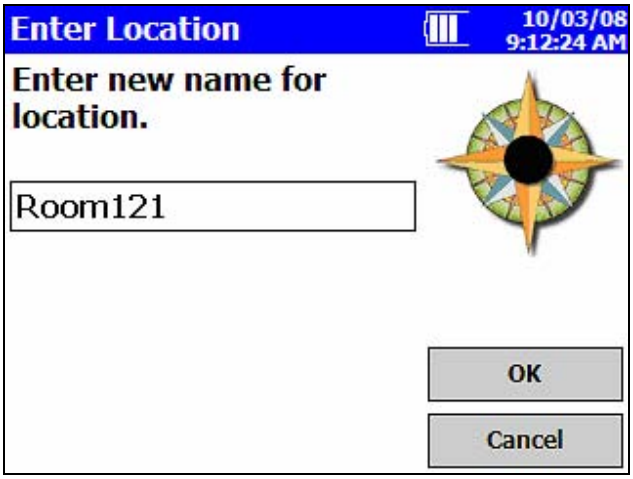
Field	Description
Automatic	If you select this mode, the instrument starts counting in automatic mode when you press the start button according to the settings on the Sample Timing Screen.
Manual	If you select this mode, the instrument starts sampling after the configured Start Delay time when you press the start button and stops at the end of the configured sample time (configured on the Sample Timing Screen).
Beep	If you select this mode, the instrument starts sampling data after the configured Start Delay time and beeps whenever the alarm threshold for the smallest bin is reached, as specified in Alarms Screen. This can be very useful when searching for leaks, especially around filters. In this mode, samples are not stored into the record database.

Locations Screen

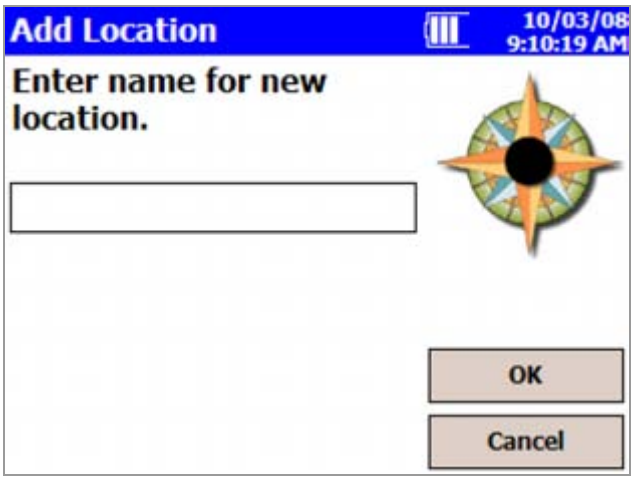
Associating collected samples with labeled locations can help keep your data organized. The instrument allows you to create up to 250 labeled locations. Use this screen to add, remove, or modify a location name.



To modify a location name, highlight the name in the list, then click the **Edit**..button. In the “Enter Location” screen click the edit box in the middle and use the on-screen keyboard to modify a location name. (You cannot edit the empty location). Click **OK** when finished.



To add a location, click on the **Add**..button . In the “Add Location” screen click in the edit box in the middle and use the on-screen keyboard to add a location name. Click **OK** when finished.

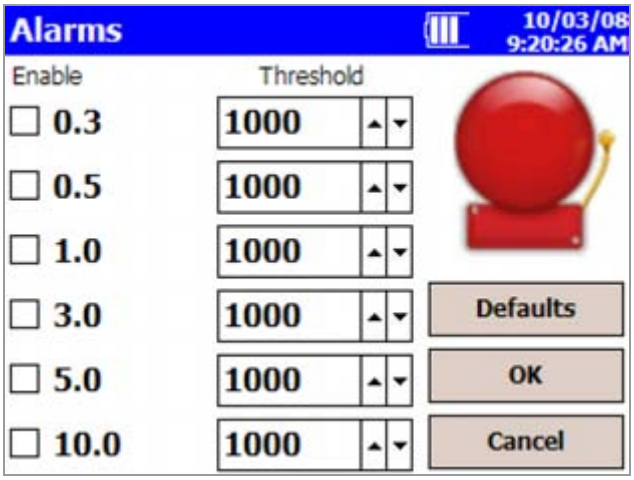


To remove a location, click on location to be removed and click the **Remove** button.

Back in the main Locations screen, after all editing has been completed, press **OK** when finished.

Alarms Screen

Use this screen to set the alarm threshold for each channel. Press **OK** when finished.



Field	Description
Enable	Select the channels on which you want to enable alarms.
Threshold	To change the threshold for any channel, click the up and down arrows for that channel or use the on-screen keyboard to change its value. The threshold value units use the current display Count Units (see Count Units Screen).

During sampling, when a channel value exceeds the threshold value you set, the channel data is highlighted in red on the Main tab, an audible alarm sounds, and the alarm icon appears on the Main tab.

To clear the alarm, click the alarm icon  In addition, the record is printed if you have selected that option on the Print Schedule Screen.

Recipe Screen

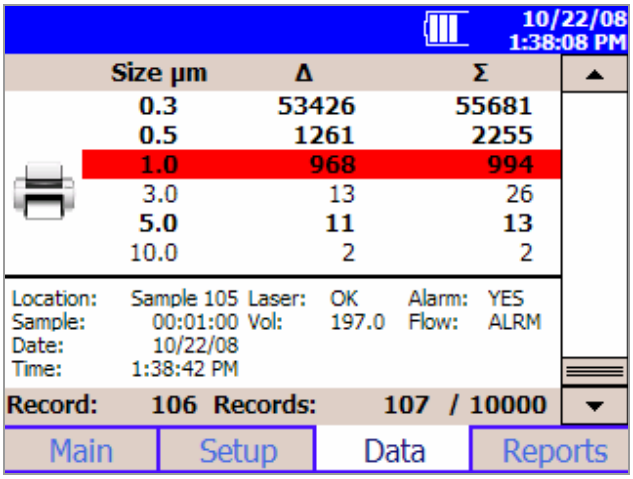
Use this screen to load and save recipes. Recipes let you save a group of settings (recipe) that you use over and over so you don't have to reset individual settings. Virtually all of the instrument configuration settings are stored in the recipe including sample timings, count mode, print settings, and display modes. There may be up to 100 recipes stored in the unit.

(continued on next page)

Field	Description
Save	When you select **Save**, a new window opens that lets you enter a name for the recipe you want to save. **The settings/parameters that are saved include:** For each channel (1–6): • Alarm setting (on/off) • Alarm threshold (value) • Channel setting (enabled/disabled) Sample Timing settings • Count mode • Count total • Start delay (in secs) • Hold delay (in secs) • Sample time (in secs) Count Mode/Units Settings • Display normalized • Units (count, ft^3 or m^3) • Cumulative/Differential • Volume units Printing settings • Auto print and mode • Print cumulative/differential Print model, separator, serial number
Save As	When you select **Save As**, a new window opens that lets you enter a name for the recipe you want to save.
Load	Highlight the recipe you want to load and press **Load**. The settings/parameters are reset to the values of that recipe.
Delete	Highlight the recipe you want to delete and press **Delete**. The recipe is deleted.

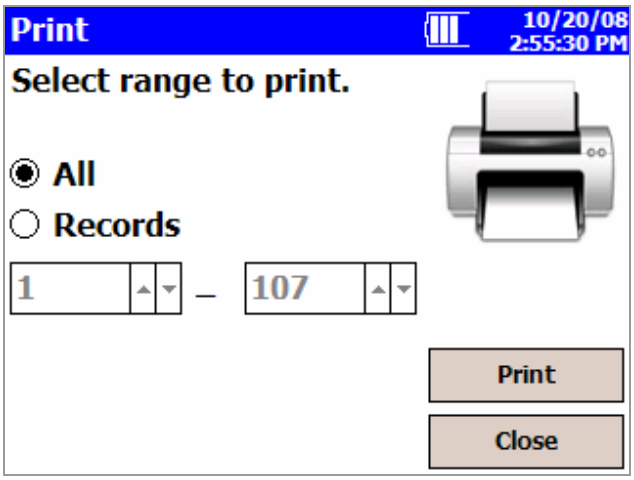
Data Tab

The Data tab lets you review data that has been collected. Use the elevator (slide) on the right to scroll though the records. The record number is displayed at the bottom of the tab. As each record displays, its data and relevant parameters are displayed.

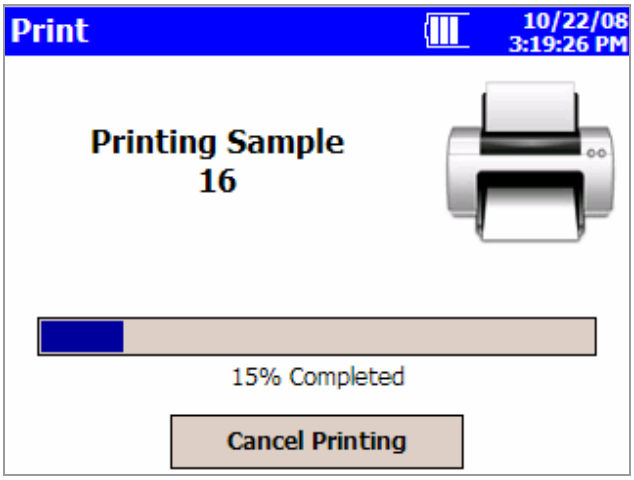


Field	Description
Size µm	Channel size.
Δ	Differential concentration.
Σ	Cumulative concentration.
Location	Location where the data was collected.
Sample	Duration of the sampling period.
Date	Date on which the data was collected.
Time	Time at which data was collected.
Flow	Status of the flow.
Alarm	Alarm threshold was triggered (YES) or not (NONE).
Laser	Status of the laser and detector: OK or SRVC (service).

The print button allows a range of sample data to be printed using the built-in printer.

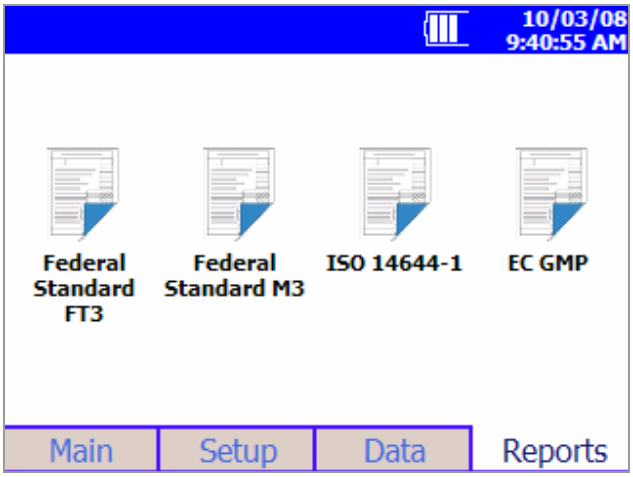


The print data screen will show progress on the current selected range of sample data to be printed. Press the **Cancel Printing** button to cancel the rest of the print job.

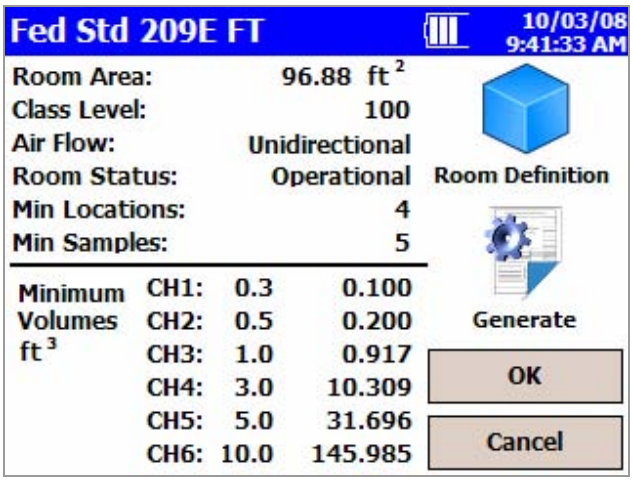


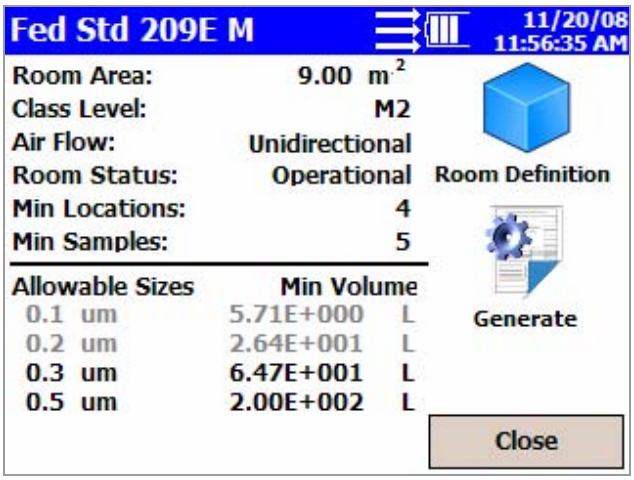
Reports Tab

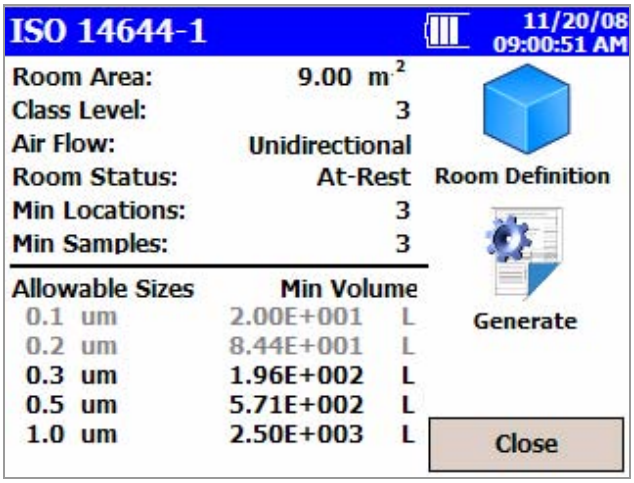
Use this screen to select various standard reports for viewing and printing.

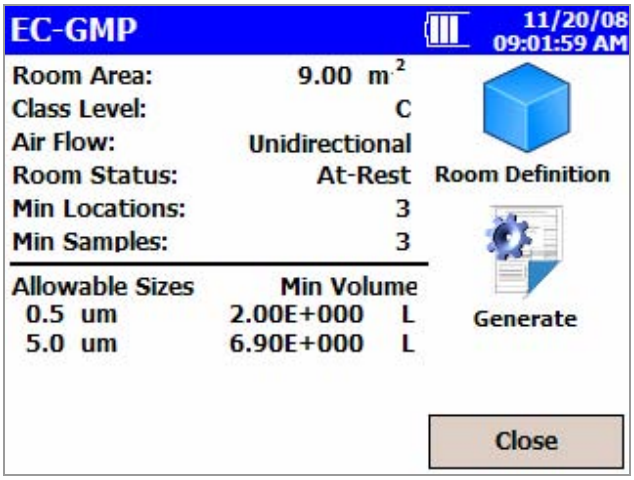


The standard reports are shown below:




Fed Std 209E M
11/20/08
11:56:35 AM
Room Area: 9.00 m2
Class Level: M2
Air Flow: Unidirectional
Room Status: Operational
Min Locations: 4
Min Samples: 5
Allowable Sizes Min Volume
0.1 um 5.71E+000 L
0.2 um 2.64E+001 L
0.3 um 6.47E+001 L
0.5 um 2.00E+002 L
Room Definition
Generate
Close


ISO 14644-1
11/20/08
09:00:51 AM
Room Area: 9.00 m2
Class Level: 3
Air Flow: Unidirectional
Room Status: At-Rest
Min Locations: 3
Min Samples: 3
Allowable Sizes Min Volume
0.1 um 2.00E+001 L
0.2 um 8.44E+001 L
0.3 um 1.96E+002 L
0.5 um 5.71E+002 L
1.0 um 2.50E+003 L
Room Definition
Generate
Close

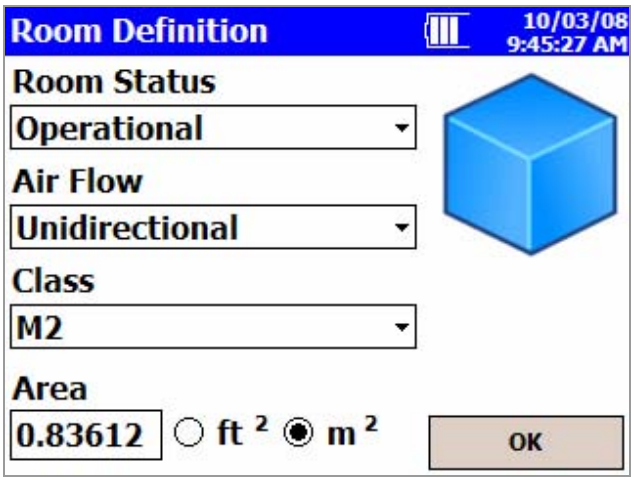

EC-GMP
11/20/08
09:01:59 AM
Room Area: 9.00 m2
Class Level: C
Air Flow: Unidirectional
Room Status: At-Rest
Min Locations: 3
Min Samples: 3
Allowable Sizes Min Volume
0.5 um 2.00E+000 L
5.0 um 6.90E+000 L
Room Definition
Generate
Close

Field	Description
Room Area	Displays the area of the room in ft^2 or m^2.
Class Level	Depends on the report definition, see below.
Air Flow	Displays the airflow characteristics of the room.
Room Status	Displays the status of the room. See Room Definition Screen below.
Min Locations	Displays the minimum number of locations that must be sampled in the room.
Min Samples	Displays the minimum number of samples that must be taken at each location.
Min Vol. per channel	Displays the minimum volume (in cubic feet or meters) that must be sampled on each channel.
Room Definition	Press to set definitions for the room. (See Room Definition Screen below.)
Generate	Select to print a single record or a range of records. (See Print Screen below.)

(continued on next page)

Room Definition Screen

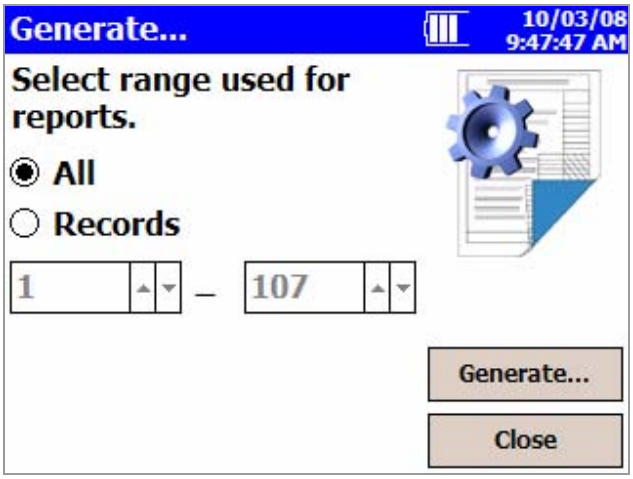
Use this screen to define specific values for the room. Press **OK** when finished.



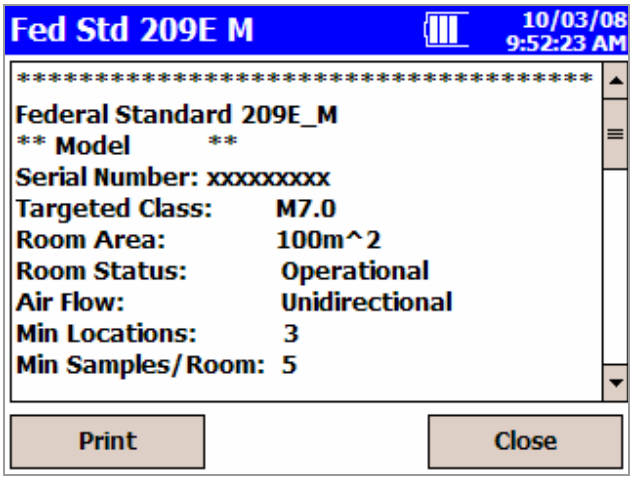
Field	Description
Room Status	Select the room status: As Built, At Rest, or Operational.
Air Flow	Select the air flow: Unidirectional or Non-unidirectional.
Class	Select the class of the room: The class is dependent on the standard: FED FT3: 1, 20, 100,1000,10000, 100000 FED M3: M1.0, M1.5, M2.0, M3.0, M3.5, M4.0, M4.5, M5.0, M5.5, M6.0, M6.5, M7.0 ISO14644-1: 1, 2, 3, 4, 5, 6, 7, 8, 9 EC GMP: A, B, C, D
Area	Use the on-screen keyboard to enter the area of the room in ft^2 or m^3.

Generate Screen

This screen lets you generate the report using either a single record or a range of records. Press the **Generate**..button to generate the selected report.



The generated report will be displayed on the screen and may be viewed on the screen or printed by pressing the **Print** button.

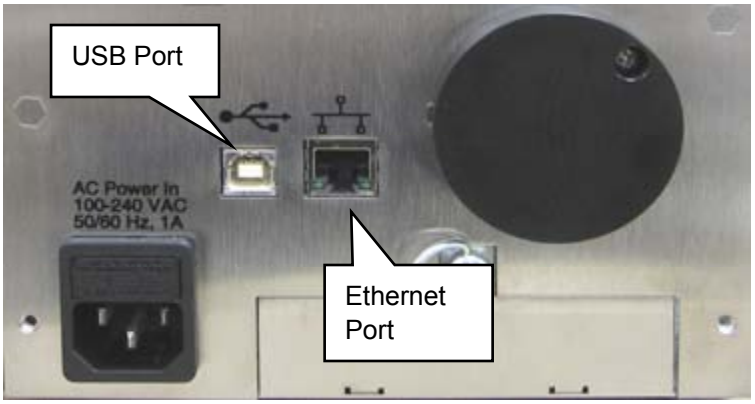


CHAPTER 4

Data Handling

USB Communication

The AEROTRAK™ Portable Airborne Particle Counters are equipped with a USB port for downloading information to a PC using the TRAKPRO™ Lite software described below. A USB cable is included with each instrument. One end plugs into the back of the instrument in the location shown below. The other end plugs into your computer USB port.



Ethernet Communications

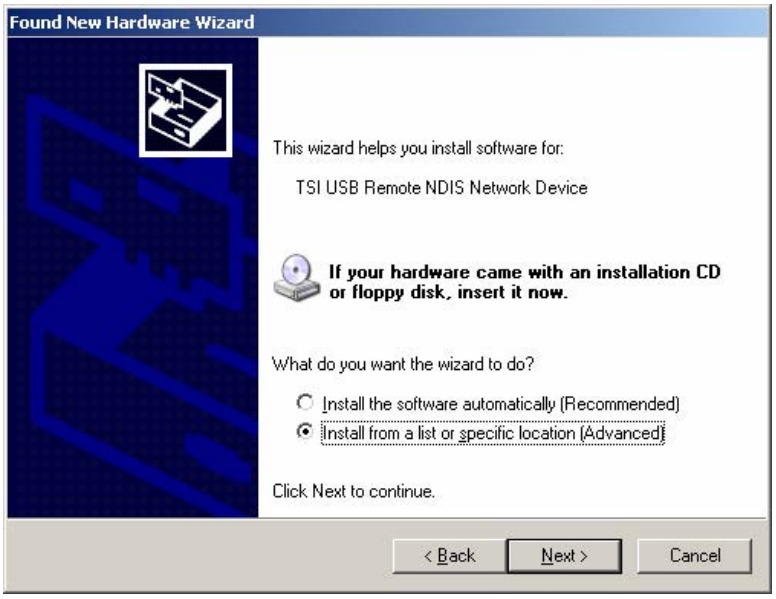
An Ethernet port is provided for use with TSI Facility Monitoring Software (FMS). Refer to the FMS Software documentation and the TSI service and installation manual for detailed configuration and operation information on Modbus RTU over Ethernet.

Installing Software

The TRAKPRO™ Lite Data Transfer utility comes on a CD that loads software and communications drivers for the particle counter. To install the software, insert the CD into your computer drive and follow the instructions. Installation consists of two parts:

- Installation of TRAKPRO™ Lite software.
  Run “setup.exe” from the provided CD and follow on-screen instructions.
- Installation of USB NDIS driver. This installation is executed transparently during the setup process and does not require user input. Once installation is finished, drivers are ready for use. When the AEROTRAK™ particle counter is connected for the first time, system will automatically detect the device and will start driver installation process.

1. When asked if Windows update should be used to download necessary software, select “No, not this time” and click **Next**.



2. Select “Install the software automatically (Recommended)” and click **Next**.

3. Hardware Wizard will search for the driver and locate it in \System32\drivers directory.

   Once that is done, the following screen will appear:

4. Depending on your system setup you may see a warning message:

5. Click **Continue Anyway** and the installation will proceed.

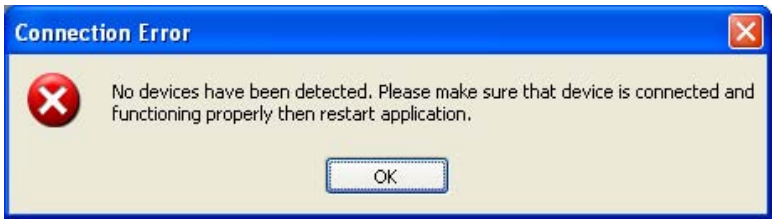
6. Once everything is completed, click **Finish**.

This procedure is required only on first connection, all subsequent devices will automatically locate the necessary drivers and install without requiring user input.

Download Data

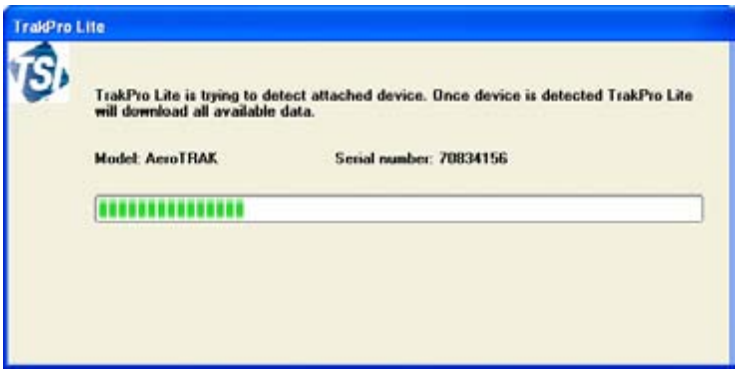
To transfer data from an instrument to a computer via the USB connection for further analysis and report generation.

- Make sure that AEROTRAK™ particle counter is attached to the computer and turned on.
- Start the application. If the AEROTRAK™ particle counter is not connected or discovered by the application, the following message appears:

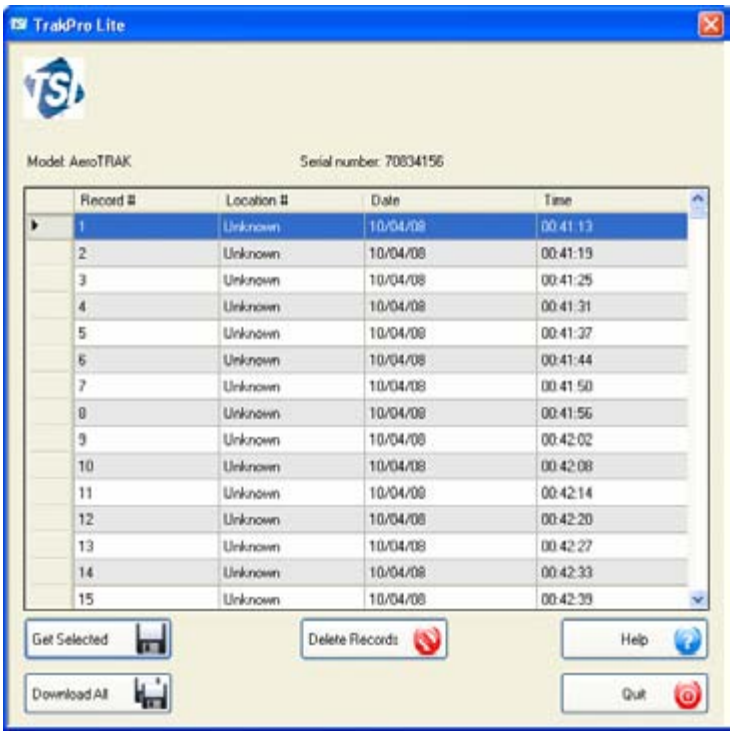


- Make sure that the AEROTRAK™ particle counter is connected, turned on, and functioning properly. Restart the application.

If communication with AEROTRAK™ particle counter has been established, the following screen appears:



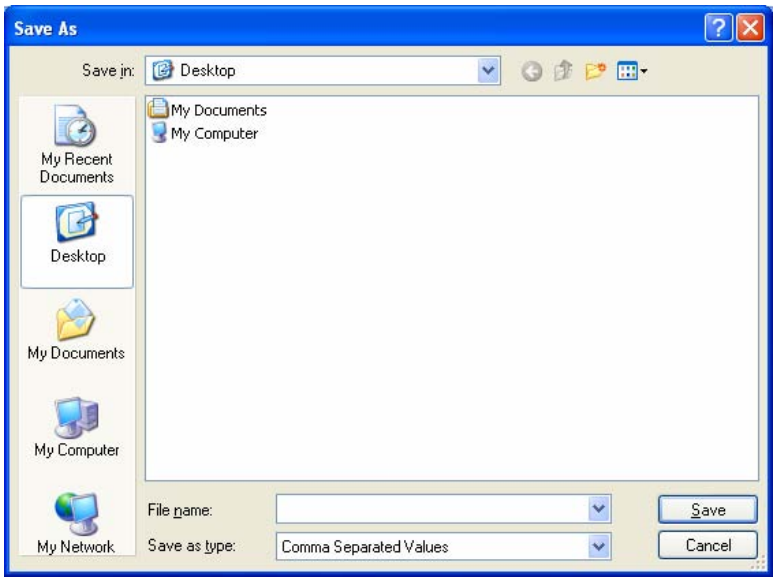
Once data is successfully downloaded, the main application screen will appear:



1. There are two options for downloading data:

- Download only user selected records:
  Hold down the **CTRL** key and use the mouse to click on the records you want to retrieve. When you have selected the records, press the **Get Selected** button to retrieve only the selected records from the device.
- Download all records:
  Press the **Download All** button to retrieve all the records from the device.

2. After you press either the **Get Selected** or **Download All** buttons, the following dialog appears to allow you to select the folder where data will be saved:



- To cancel the data transfer, select **Cancel**.
- To accept the data transfer, enter the file name under which data will be saved and select **Save**.
- Data is stored in a .CSV file that can be opened by most spreadsheet programs such as Microsoft® Excel® spreadsheet software.

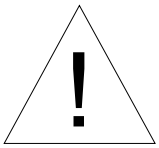
File Edit View Insert Format Tools Data Window Help

	A	B	C	D	E	F	G	H	I	J	K	L
1	Record#	Location#	Date	Time	SampleTime	HoldTime	Ch1		Ch2		Ch3	
2												
3	1	118	1/15/2000	2:08:20	1:00	0:00	0.3um	75628	2.5um	71882	5.0um	1264
4	2	111	1/15/2000	2:09:59	0:05	0:00	0.3um	6314	2.5um	6014	5.0um	1279
5	3	111	1/15/2000	2:10:06	0:05	0:00	0.3um	5960	2.5um	5665	5.0um	1246
6	4	111	1/15/2000	2:10:12	0:05	0:00	0.3um	6465	2.5um	6144	5.0um	1195
7	5	111	1/15/2000	2:10:18	0:05	0:00	0.3um	6476	2.5um	6155	5.0um	1285
8	6	111	1/15/2000	2:39:44	0:05	0:00	0.3um	6410	2.5um	6106	5.0um	1493
9	7	111	1/15/2000	2:40:34	0:05	0:00	0.3um	5900	2.5um	5617	5.0um	1237
10	8	111	1/15/2000	2:40:40	0:05	0:00	0.3um	6226	2.5um	5923	5.0um	1298
11	9	111	1/15/2000	2:40:47	0:05	0:00	0.3um	6314	2.5um	5983	5.0um	1325
12	10	111	1/15/2000	2:40:53	0:05	0:00	0.3um	6015	2.5um	5729	5.0um	1264
13	11	111	1/15/2000	2:41:26	0:05	0:00	0.3um	6006	2.5um	5704	5.0um	1279
14	12	111	1/15/2000	2:46:21	0:05	0:00	0.3um	6035	2.5um	5753	5.0um	1246
15	13	111	1/15/2000	2:46:27	0:05	0:00	0.3um	5989	2.5um	5719	5.0um	1195
16	14	111	1/15/2000	2:46:34	0:05	0:00	0.3um	6041	2.5um	5750	5.0um	1285
17	15	111	1/15/2000	2:46:40	0:05	0:00	0.3um	5875	2.5um	5597	5.0um	1219
18	16	111	1/15/2000	2:46:46	0:05	0:00	0.3um	5883	2.5um	5634	5.0um	1229
19	17	111	1/15/2000	2:46:53	0:05	0:00	0.3um	5920	2.5um	5633	5.0um	1223
20	18	111	1/15/2000	2:46:59	0:05	0:00	0.3um	6001	2.5um	5731	5.0um	1270
21	19	111	1/16/2000	22:40:22	0:05	0:00	0.3um	1446	2.5um	1411	5.0um	678
22	20	111	1/17/2000	3:22:11	0:05	0:00	0.3um	6873	2.5um	6593	5.0um	3008
23	21	111	1/17/2000	3:22:17	0:05	0:00	0.3um	9623	2.5um	9204	5.0um	3656
24	22	111	1/21/2000	20:12:29	0:05	0:00	0.3um	16033	2.5um	15231	5.0um	4209
25	23	111	1/21/2000	20:12:35	0:05	0:00	0.3um	16113	2.5um	15304	5.0um	4209
26	24	111	1/21/2000	20:12:42	0:05	0:00	0.3um	16426	2.5um	15663	5.0um	4228

Delete Data

In order to delete data from the device click **Delete Records** button. The following warning will appear:

If **Yes** is selected, TRAKPRO™ Lite software will erase data from the device and also from application memory.



W A R N I N G
Deleting data is an irreversible operation. Download and save data *before* deleting in order to have a copy for future use.

CHAPTER 5

Maintenance

Note
There are no user-serviceable parts inside this instrument. Opening the instrument case may void the warranty. TSI recommends that you return the AEROTRAK™ Airborne Particle Counter to the factory for any required maintenance or service not described in this manual.

Maintenance Schedule

TSI recommends annual factory cleaning and calibration for the AEROTRAK™ Airborne Particle Counter. See Chapter 7, "Contacting Customer Service" for service/calibration.

Recommended Field Maintenance Schedule

Item	Frequency
Zero check	Daily or according to application
Clean inlet	Monthly, or as needed.
Factory cleaning and calibration	Annually.
Cleaning the instrument enclosure	As needed

Zero Check

The zero check ensures that the instrument is properly assembled and free from leaks, residual particles, and electronic noise. Please see Chapter 2, "Getting Started" for detailed instructions on performing the zero check.

Cleaning the Instrument Enclosure

To clean the enclosure, dampen a lint-free cloth and gently wipe the surface until surface contamination is removed.

CHAPTER 6

Troubleshooting

Symptom	Possible Cause	Corrective Action
Counts are too low	Instrument is being operated outside temperature or relative humidity specifications	Operate instrument within specifications
	Internal parts have been damaged because instrument was stored at a temperature greater than 122 °F (50 °C)	Return to factory for service
	Instrument has contamination on the optics due to condensation or excessive loading	Return to factory for service
	Laser or pump control is damaged	Return to factory for service
	Unit is due for calibration	Return to factory for service
Instrument does not turn on	 The on/off button is not being pressed properly.	Press and hold the on/off button for one second.
	Battery is not charged.	Recharge battery or connect to AC power.
	AC cord is not plugged into unit.	Connect AC cord.
	The fuse, located in the fuse holder immediately above the AC power inlet has blown.	Replace the fuse.

Symptom	Possible Cause	Corrective Action
Instrument does not meet zero count specification (<1 particle/5 mins)	HEPA filter is not connected properly and room air is leaking into the HEPA filter assembly	Check that the HEPA filter has been tightly connected to the inlet. Check that rubber o-ring (black) on the inlet is in place
	Residual particles from previous samples are shedding off internal parts and into the optics	Purge instrument by running the instrument for 10 to 15 minutes before attempting zero count test
	An internal component has been damaged due to operation outside of temperature specifications or one ore more excessive bumps or jolts, and electronic noise is inducing false counts	Return to factory for service
	A leak has developed in the aerosol flow path.	Return to factory for service.
	Internal optics have become dirty.	Return to factory for service.
Battery does not charge	The unit must be turned on but not in sampling mode for the battery to charge.	Turn on unit. Green LED by on/off button should be lit.
LOW BATTERY ERROR 	Low battery.	Recharge battery or connect AC cord.
FLOW ERROR 	Instrument was unable to control flow rate (if any tubing is connected to particle counter).	Restart measurement.
	Pressure drop across inlet may be too large.	Lessen pressure drop across inlet by using larger diameter tubing, less tubing, and/or adding a bleed valve.
	Inlet not at ambient pressure.	Do ***not*** subject the unit to other than ambient pressure conditions.
LASER POWER / DETECTOR WARNING 	Direct light is entering the aerosol inlet.	Remove instrument from direct light.
	Laser power has fallen outside of specification, has become misaligned, or internal optics have become dirty.	Return to factory for service.

CHAPTER 7

Contacting Customer Service

This chapter gives directions for contacting people at TSI Incorporated for technical information and directions for returning the AEROTRAK™ Portable Airborne Particle Counter for service.

Technical Contacts

- If you have any difficulty setting up or operating the AEROTRAK™ Portable Airborne Particle Counter, or if you have technical or application questions about this system, contact an applications engineer at TSI Incorporated, 1-800-874-2811 (USA) or (651) 490-2811 or e-mail technical.service@tsi.com.
- If the AEROTRAK™ Portable Airborne Particle Counter, does not operate properly, or if you are returning the instrument for service, visit our website at http://rma.tsi.com, or contact TSI Customer Service at 1-800-874-2811 (USA) or (651) 490-2811.

International Contacts

Service

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Web: www.tsiinc.co.uk

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Web: www.tsiinc.fr

Returning the AEROTRAK™ Portable Airborne Particle Counter for Service

Visit our website at http://rma.tsi.com or call TSI at 1-800-874-2811 (USA) or (651) 490-2811 for specific return instructions. Customer Service will need this information when you call:

- The instrument model number
- The instrument serial number
- A purchase order number (unless under warranty)
- A billing address
- A shipping address

Use the original packing material to return the instrument to TSI. If you no longer have the original packing material, seal off any ports to prevent debris from entering the instrument and ensure that the display and the connectors on the instrument front and back panels are protected.

APPENDIX A

Specifications

All specifications meet or exceed JIS B 9921 and are subject to change without notice.

Size Range	9310/9350: 0.3–20 µm 9510/9550: 0.5–20 µm
Channel Sizes (additional channel sizes available)	9310: 0.3, 0.5, 1.0, 3.0, 5.0, 10 µm 9350: 0.3, 0.5, 1.0, 2.0, 3.0, 5.0 µm 9510 0.5, 0.7, 1.0, 3.0, 5.0, 10 µm 9550: 0.5, 0.7, 1.0, 3.0, 5.0, 10 µm
Counting Efficiency	9310/9350: 50% @ 0.3 µm; 100% for particles >0.45 µm (per JIS) 9510/9550: 50% @ 0.5 µm; 100% for particles >0.75 µm (per JIS)
Concentration Limits	9310/9510: 400,000 particle/ft^3 at 5% coincidence loss 9350/9550: 250,000 particle/ft^3 at 5% coincidence loss
Light Source	Laser diode
Zero Count Level	<1 count/5 minutes, Meets JIS B9921
Flow Rate	9310/9350: 28.3 L/min (1.0 CFM) with ±5% accuracy 9510/9550: 50 L/min (1.77 CFM) with ±5% accuracy
Flow Control	Automatic
Calibration	NIST traceable
Sample Probe/Tubing	Isokinetic sampling probe
Sampling Modes	Manual, automatic, beep, cumulative/differential count, or concentration
Sampling Time	1 second to 99 hours
Sampling Frequency	1 to 9999 cycles or continuous
Sample Output	Internal HEPA filter
Vacuum Source	Internal pump with patented* flow control technology
Communication Mode	USB and Ethernet (TCP/IP) output
Data Storage	10,000 sample records
Data Security	Password protected
Alarm/Status	Audible alarm on counts, and sensor status indicators
Display	QVGA 5.7-inch touch screen with Windows® CE
Languages	English

Reports	On screen viewable and printable ISO-14644-1, FS-209E & EC GMP
Printer	Built-in thermal printer (also available without printer)
External Surface	Stainless Steel
Power	110 to 240 VAC 50 to 60 Hz Universal in-line power supply
Battery	Removable/rechargeable Li-Ion
Battery Life	9310/9510: Up to 4 hours of continuous use 9350/9550: Up to 3 hours of continuous use
Recharge Time	3.5 hours (internal or external)
Dimensions (L x W x H)	25.6 x 17.6 x 26.1 cm (10 x 7 x 9.5 in.)
Standards	CE, JIS B 9921
Weight	5.8 kg (12.8 lbs) with battery, 5.4 kg (11.8 lbs) without battery
Warranty	2 years. Extended warranties available
Operating Conditions	5 to 35°C (41° to 95°F); 20% to 95% non-condensing relative humidity
Storage Conditions	0 to 50°C (32 to 122°F); Up to 98% non-condensing relative humidity
Included Accessories	Operating manual on CD, power cord, battery, isokinetic probe, tripod, 3 m (10 ft) tubing, purge filter, printer paper, USB cable, and TRAKPRO™ Lite data download software
Optional Accessories	Spare battery, dual port external battery charger, isokinetic inlets, sample tubing, and carrying case

*Patent Number 6,167,107

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Contact your local TSI Distributor or visit our website **www.tsi.com** for more detailed specifications.

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