CONTAMINATION CONTROL

Portable Particle Counters

AEROTRAK™ Portable Airborne Particle Counter

Model 9110

Operation Manual

P/N 6004345, Revision A
July 2010

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Manufacturer of TSI®, AIRFLOW™ Instruments, and Alnor® products.

P/N 2980174 Rev E

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Manual History

The following is a manual history of the AEROTRAK™ Portable Airborne Particle Counter, Model 9110 Operation Manual (P/N 6004345).

Revision	Date
-	July 2010

Warranty

Part Number 6004345 / Revision A / July 2010

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 (24) 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).

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Contents

Safety Information

This section gives instructions to promote safe and proper handling of the Model 9110 AEROTRAK™ Portable Airborne Particle Counter.

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

- This Portable Airborne Particle Counter is a Class I laser-based instrument.
- 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:

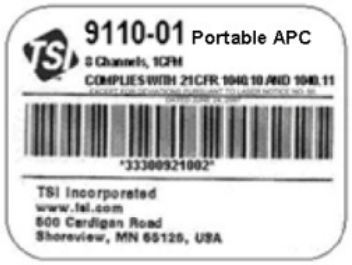
- ***DO NOT*** remove any parts from the particle counter unless you are specifically told to do so in this manual.
- ***DO NOT*** remove the housing. There are no user-serviceable components inside the housing.

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

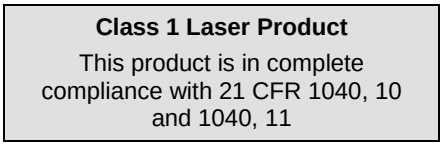
Labels

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)

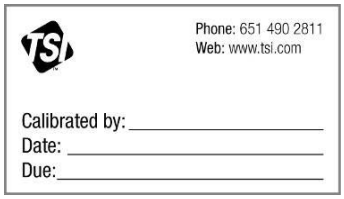


2. Laser instrument compliance label (*back panel*)



3. Laser radiation symbol label (back panel)

4. Calibration label (right-side panel)



5. European symbol for non-disposable item. Item must be recycled. (back panel)

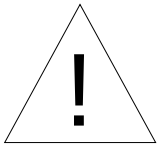
6. High voltage warning label (internal)

7. Laser warning label (internal)

Description of Caution/Warning Symbols

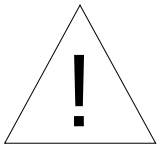
Appropriate caution/warning statements are used throughout the manual and on the instrument that require you to take cautionary measures when working with the instrument.

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.

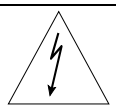
Warning



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 TSI AEROTRAK™ 9110 Portable Particle Counter offers an accurate measurement of particles down to 0.100 µm. This is made possible utilizing a patented HeNe laser technology that is low maintenance with an enhanced signal to noise ratio. The Model 9110 is ideal for performing ISO-14644-1 classifications for Class 1 and Class 2 clean rooms. This instrument is designed for clean room monitoring, process tool monitoring, and filter test applications.

The Model 9110 can generate pass/fail reports for ISO 14644-1. This product can be used as a stand-alone particle counter, with TRAKPRO™ Lite software (included) or integrated into a facility monitoring system like TSI FMS 5.

The Model 9110 Airborne Particle Counter is available with the characteristics listed below.

Model	Size Range (µm)	Flow Rate	No. Size Channels	Size Channels (µm)
9110-01	0.100 to 10	28.3 L/min (1 cfm)	8	0.100, 0.15, 0.2, 0.25, 0.3, 0.5, 1.0, 5.0 µm

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	9110-01	
1	Barb Inlet Fitting (installed)	700107	
1	Power Supply 24 VDC 3.0A (Power cord included is country dependent)	801692	
1	Country-Specific Power Cord	700057 (US) 700058 (UK) 700058 (Euro)	
1	Battery pack (can install up to 4 ea.)	700028	
1	Tripod for isokinetic probe	3000192	
3 m (10 ft)	Sample Tubing (3/8 ID x 1/2 OD)	700062	

Qty.	Item Description	Part/Model	Reference Picture
1	Isokinetic probe	700106	
1	Computer cable (2 m), USB A to B	700033	
1	Stylus	N/A	
1	TRAKPRO™ Lite data download utility CD (includes manual)	7001384	
1	Operation Manual	6004345	(installed on TRAKPRO™ Lite software CD)
1	Calibration certificate	N/A	
1	Quick Start Guide	6004346	

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 9110/AEROTRAK™ Airborne Particle Counter Optional Accessories

Item Description	Part/Model	Reference Picture
HEPA zero filter	700104	
Fan filter module	700110	
Replacement filters (pack of 5)	700100	
Isokinetic inlet	700105	
1 cfm Electronic Filter Scanning Probe (with start/stop, LED, sound)	700103	
1 cfm “Basic” Filter Scanning Probe	700102	
Tubing, Superthane 3/8-inch ID x 1/2-inch OD, Clear 100 ft	700062	

Item Description	Part/Model	Reference Picture
Printer paper (10 rolls)	700027	
Dual Battery Charger Supplied w/ US Power Cord, Order international cord separately	700029	
Velocity/Temperature/ Relative Humidity Probe	964 (Straight) 966 (Articulated)	
Velocity/Temperature Probe	960 (Straight) 962 (Articulated)	

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CHAPTER 2

Getting Started

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

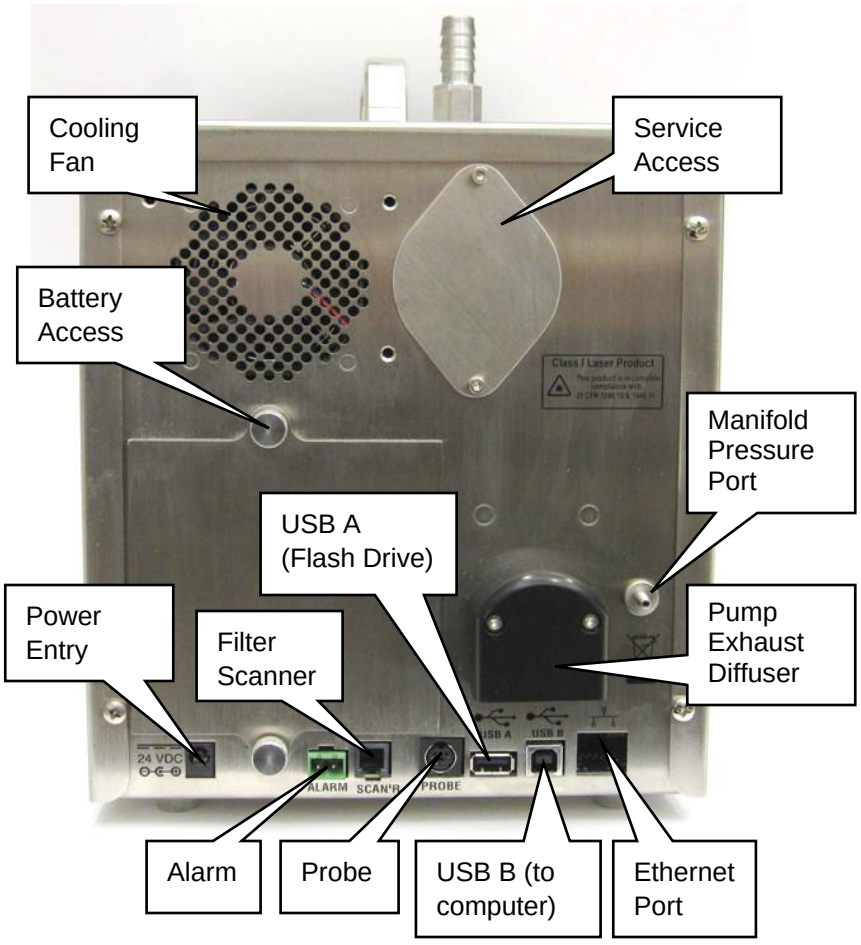
Instrument Description

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 front of the instrument is a built-in printer.

The back of the instrument has many features that are described in the table below.

Description	Function
Cooling fan	Exhausts air from the cabinet to keep it cool. An optional HEPA filter is available to filter the exhaust from the cooling fan (see *Optional Accessories* in Chapter 1).
Service access door	Access for factory-directed adjustment only.
Battery access	This plate provides access to a battery bay. The instrument can be run on up to four rechargeable batteries to allow portable operation for up to four hours or with a single battery to allow switching outlets between rooms without powering the unit down.
Manifold pressure port	This is used only with the TSI Manifold Switching Valve to provide an upstream pressure tap for more accurate flow control.

Description	Function
Pump exhaust diffuser	Provides an outlet for the filtered exhaust
Power connection	This power connection is for use with an external supply. Only the TSI-supplied 24 VDC power supply model 6001584 should be used.
Alarm	This connector provides two pins for a contact closure to control an external alarm. The contact closure is normally open and rated for 0 to 60 V AC/DC at 1.5A peak, 0.5A continuous. The contact is closed under alarm conditions determined by the programming of the device.
Filter Scanner	This connector is used with the optional TSI Electronic Filter Scanner (700103).
Probe	This connector is used with a variety of TSI velocity/ temperature/humidity probes.
USB A	This standard USB connector is provided for use with “flash drive” devices to download data from the instrument and transfer to a computer or other device. The data files are in ASCII format for easy use in spreadsheet programs. This port can also be used to also connect a keyboard if desired.
USB B	The standard USB connector is used to connect the instrument to a computer running TSI TrakPro Lite software for data downloading and recipe uploading. It is used with a standard USB cable (included).
Ethernet Port	The particle counter is compatible with either 10 or 100 MBps systems. The green LED indicates that the network is connected. The yellow LED indicates activity on the network cable.



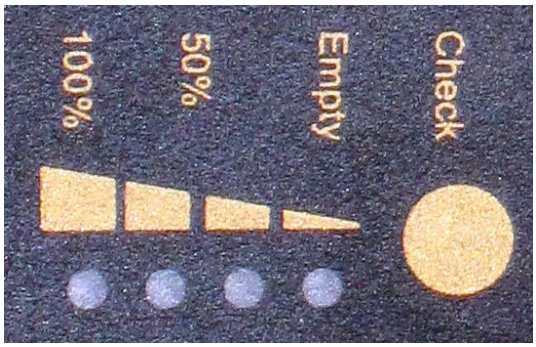
Providing Power

These particle counters may be powered using rechargeable lithium-ion batteries (from one to four) or through an AC power cord.

Notes:

- When using AC power, the battery (if installed) charges when the instrument is on, while actively sampling (trickle charging), and when the power is put in standby—charge battery mode.
- 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 two thumbscrews counterclockwise.

2. One battery is provided but up to four batteries can be used to extend the run time up to four hours of continuous use. Slide the battery into the slot (it doesn't matter which one), pressing until it is flush with the back panel (note the orientation of the tabs).
3. Replace the battery door and secure with the two thumbscrews.
4. The batteries are charged when the unit is running (trickle-charge). When the unit is powered down with batteries installed, an option is given to power the batteries at 100% charge, two at a time. If you use the unit with batteries a lot of

the time, you might also consider using the TSI external battery charger (see *Optional Accessories* in Chapter 1).

***Note**: It is also possible to "hot swap" batteries if you are careful. As long as one charged battery is engaged at all times, a fully charged battery can be inserted and then the depleted battery removed without powering down the unit.*

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. Do ***not*** use any other type of battery in this instrument. Fire, explosions, or other hazards may result.

To Use AC Power

Connect the country-appropriate power cord to the external power supply. Next connect the 24 VDC connector to the socket in the particle counter and then connect the other end to an AC outlet.

W A R N I N G
The instrument turns on automatically when the AC power supply is plugged in.

Using the Stylus

The particle counter is 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 front-mounted integral thermal printer is standard on the Model 9110-01 to print manually, automatically after each test is completed, or whenever the alarm function is activated (see Print Setup 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.

The printer has an LED indicating that the printer is ready.

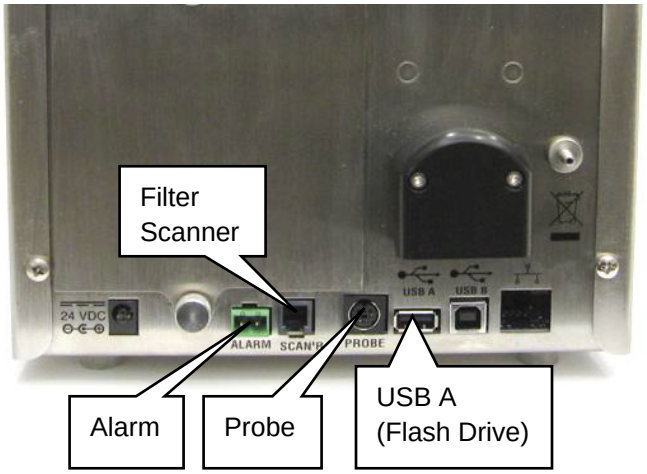
There is also a feed button  to allow a manual feed of the paper before tearing it off. To tear off, pull steadily down on the paper from one side of the serrated edge to the other.

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.

Using Peripherals

Connecting to the Alarm Closure

This connector provides two pins for a contact closure to control an external alarm. The contact closure is normally open and rated for 0 to 60 V AC/DC at 1.5A peak, 0.5A continuous. The contact is closed under alarm conditions determined by the programming of the device. When used with an externally powered device, this can trigger a visual or audible local alarm (such as a light pole).



Filter Scanner

This connector is used with the optional TSI Electronic Filter Scanner (700103). Plugging in the connector from the Electronic Filter Scanner allows you to start and stop a sample from the probe head. In addition, the alarm for exceeding a given level can be heard at the probe as well as from the instrument.

Probe

This connector is used with a variety of TSI velocity/temperature/humidity probes such as those listed below. The probe is plugged into this port with the power off. When a probe is connected to the instrument, additional velocity, temperature, and relative humidity information is displayed on the top, center of the main screen as well as stored in each data file. Data for these parameters is averaged over the sample time for each sample.

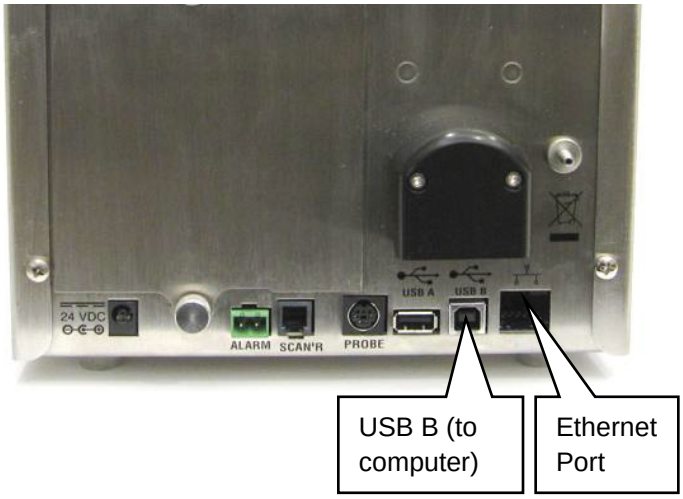
Velocity/Temperature/ Relative Humidity Probe	964 (Straight) 966 (Articulated)
Velocity/Temperature Probe	960 (Straight) 962 (Articulated)

USB A

This standard USB connector is provided for use with “flash drive” devices to download data from the instrument and transfer to a computer or other device. The data files are in XML format for easy use in spreadsheet programs. You can plug in a flash drive at any time. Make sure there is enough space free on the drive to download data files. See instructions on using the flash drive in Chapter 4.

A keyboard can also be used with this standard USB connector, to facilitate data entry at the portable, if desired, as an alternative to the touchscreen keyboard.

Using Communications Ports



USB B

The standard USB B connector is used to connect the instrument to a computer running TSI TRAKPRO™ Lite software for data downloading and analysis. It is used with a standard USB cable and TRAKPRO™ Lite Software (both included).

Ethernet Port

The particle counter is compatible with either 10 or 100 MBps systems. The green LED indicates that the network is connected. The yellow LED indicates activity on the network cable. The instrument cannot be operated using power-over-Ethernet (POE).

The Ethernet LAN connector is a standard 10/100 Mbps 8 Position 8-Contact (8P8C, often called RJ45) modular plug connection.

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. Attach a HEPA filter to the barbed inlet of the instrument. If the test is done outside a clean room, you will likely need two filters in series to get a good zero count.
2. Turn on the instrument and wait until the main menu appears.

3. Let the system run for 20 to 30 minutes to warm up.

   Press the  button and allow the instrument to purge for 2 minutes.

4. 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. Sample for 15 minutes. If 0 (zero) counts are observed, the instrument passes less than 1 particle per 5 minutes at a 95% confidence level; otherwise sample for longer time for better statistics. Use ISO 21501-4 Annex D to calculate the false count rate at 95% confidence level for zero count sampling times greater than 15 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.*

5. Remove the zero filter assembly.

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.

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.

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CHAPTER 3

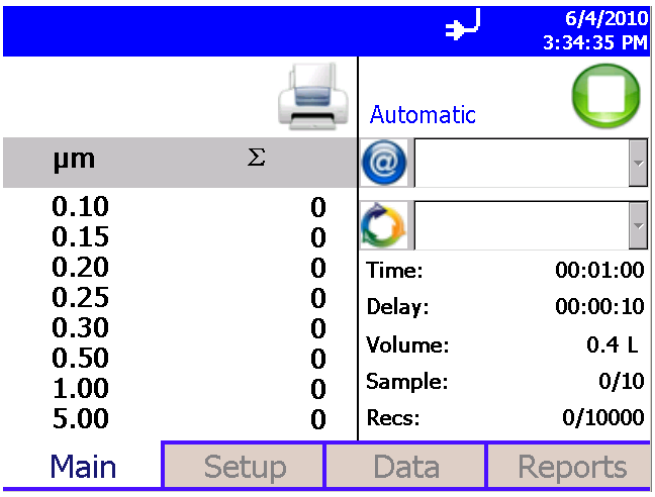
Operation

The AEROTRAK™ Portable Airborne Particle Counter is 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. If an optional temperature/humidity probe is attached, those values will be shown in the upper-left white area also.

The printer icon comes on when sampling is started.



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 concentrations for the currently selected location. Tap on the size and count portion of the screen to enable Zoomed Data Screen (see Setup Tab).

The display shows:

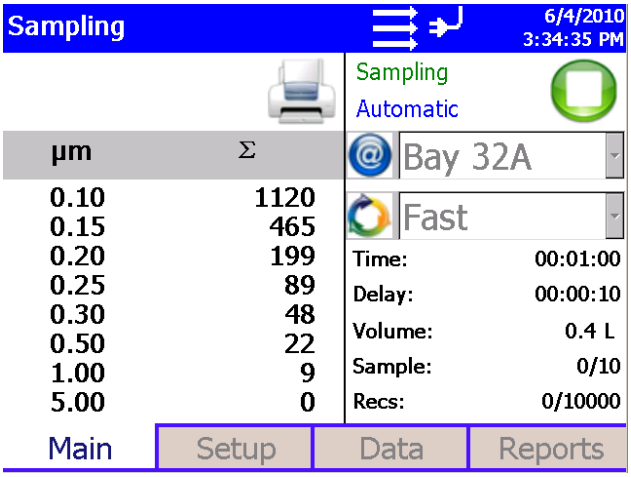
- Temperature*
- Relative humidity*
- Bin sizes
- Particle count/concentration

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

Icon	Description
	Laser requires service.
	Sufficient flow through the instrument ***Note**: During Start Delay (Delay) and Hold Times (Hold), this is only an indicator of flow On. During Sample Time (Time), this is an indicator of flow within specified tolerances*.
	Insufficient flow through the instrument ***Note**: During Start Delay (Delay) and Hold Times (Hold) this is an indicator of flow Off. During Sample Time (Time) this is an indicator of flow not being within specified tolerances.*
	Operating on AC power, no battery installed.
	Operating on AC power, battery is installed and charging.
	Battery charged, and operating on battery.
	Low battery, and operating on battery.
	Battery must be charged, and operating on battery.

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

*Temperature and Humidity are displayed only if the optional T/H probe is installed.



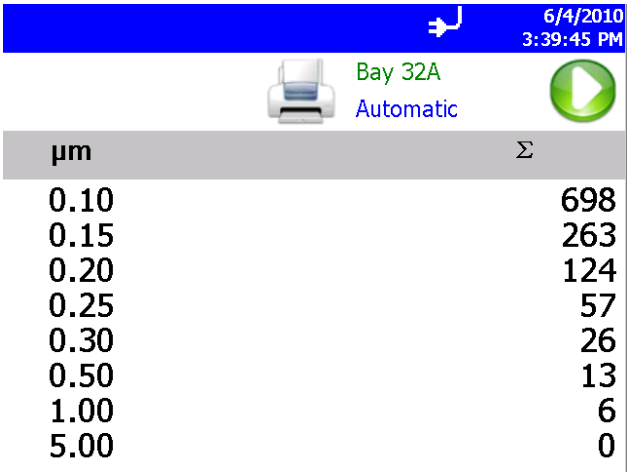
Field	Description
(Location)	Location describes where a sample is being taken. This dropdown box displays information about saved locations. The chosen location displayed on the Main screen is the location associated with the sample to be taken.
	A recipe is the group of settings that are used for a sample. This dropdown box displays the saved recipes. The chosen recipe displayed on the Main screen is the recipe associated with the sample to be taken.
Time	The time for each sample.
Delay/Hold	Delay/Hold describes the time that the particle counter is waiting before a sample starts, and in between samples when multiple samples are taken. It represents time that data is not being collected. The Delay/Hold displays as follows: 1. Before the Start button is pressed the (Start) Delay time is displayed and then immediately after the Start button is pressed the Delay time begins a countdown. 2. Between data collection (after the Start Delay has occurred), the Hold time is displayed and then begins a countdown.
Volume	The volume of air sampled for a given sample.
Sample	The specific sample being taken out of the total number of samples programmed to be taken.
Recs	The total number of records in the database/10000 (maximum number of records).
Manual/Automatic/Beep	Mode Indicator; refers to the “Data Count Mode” (see section below).
	Start/Stop button to begin and end sampling in the configured mode.
	Press to print the current sample to the optional printer.

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:

- Temperature*
- Relative humidity*
- Air Velocity
- Bin sizes
- Particle count/concentration



Field	Description
Location	Label that displays information about the currently selected location.
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.

*Temperature and Humidity are displayed only if the optional T/H probe is installed.

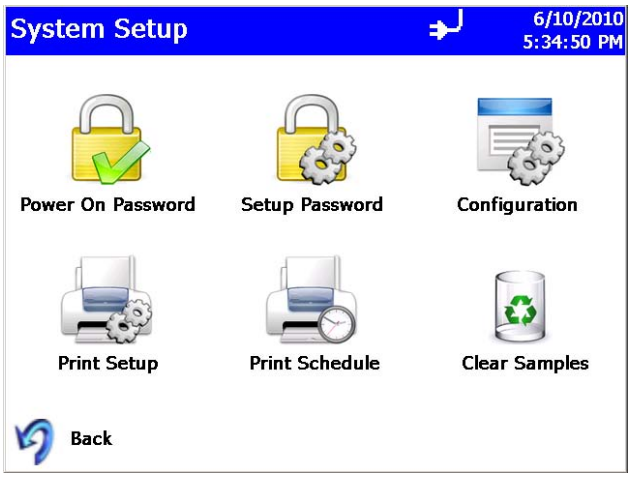
Setup Tab

The setup tab provides access to the following:

Sampling Setup	Set up Particle Channels, Sample Timing, Particle Channel Alarms, Sample Count Mode, Count Units, and Environment display settings.
Locations Setup	Identify and save the location information associated with collected samples.
Recipe Setup	Save a group of settings (a recipe) that you use over and over so you don't have to reset individual settings.
System Setup	Change Power On Password, Setup Password, System Configuration, Print Settings, Print Schedule and Clear Samples
Device Setup	Set Date and Time, Screen Alignment, Communications, Regional Settings, and get device information.

System Setup Screen

From the System Setup screen you can select (or change) the power on password, set up a password, select system configuration parameters, select print settings, schedule printing and clear samples.



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.

N o t e
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) or leave blank.
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.

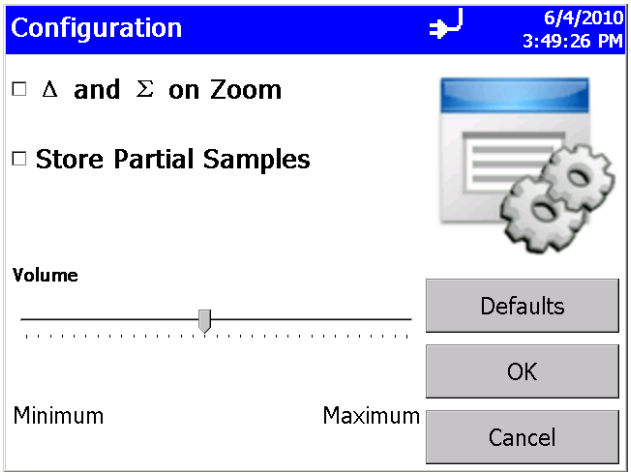
Tap on the screen to display the on-screen keyboard end enter the required information.

Field	Description
Old Password	Enter your existing password (if one has already been set) or leave blank.
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
Leave both New Password and Confirm New Password fields blank to turn off password protection.

Configuration Screen

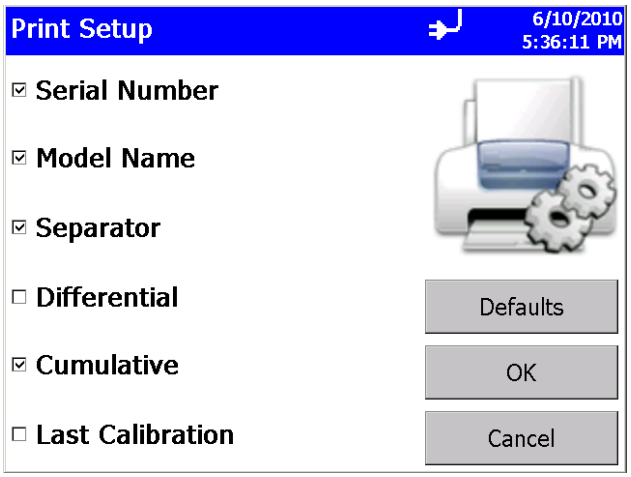
Use this screen to set configuration parameters. Press **OK** when finished.



Field	Description
Δ and Σ on Zoom	Select to zoom in on both cumulative ( ) and differential ( ) counts on the Main Tab. To zoom the Main Tab, select on the left side of the Main Tab. (It takes a moment for the screen to update.) Click on the screen again to return to normal view.
Store Partial Samples	When selected, stores the partial record in the current database if the instrument is stopped during a sampling period.
Volume	Controls the alarm volume setting

Print Setup Screen

A hard copy of a sample set or statistics can be printed from the instrument using an optional thermal printer. Use this screen to set print parameters. Press **OK** when finished.

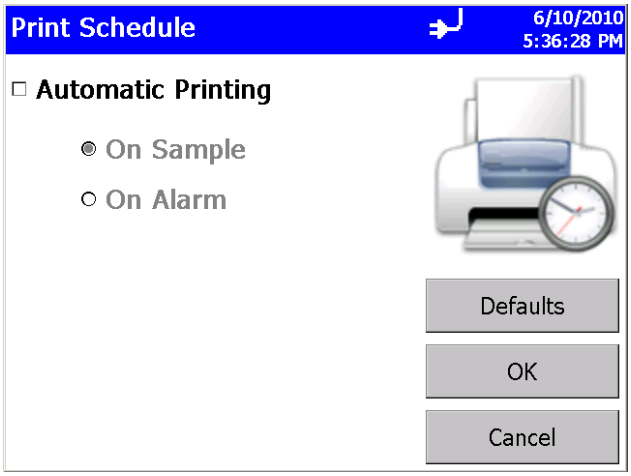


Field	Description
Serial Number	Indicates that the serial number of the particle counter used to collect the data will be printed.
Model Name	Indicates that the model number of the particle counter used to collect the data will be printed.
Separator	Indicates a line separator will be printed after the 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.
Last Calibration	The date and time the instrument was last calibrated by TSI.

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

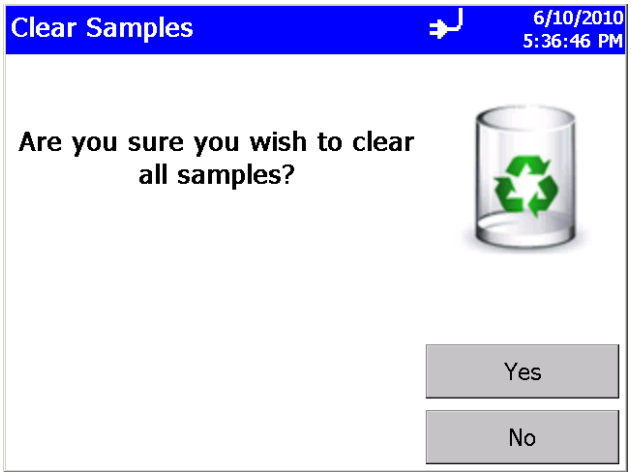
Use this screen to schedule automatic printing. Choose to either print when an alarm occurs or print whenever a sample is complete.



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

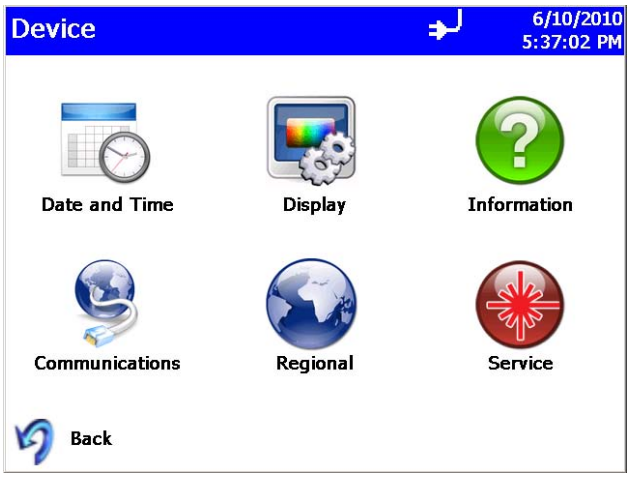
Clear Samples Screen

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 System Setup screen.



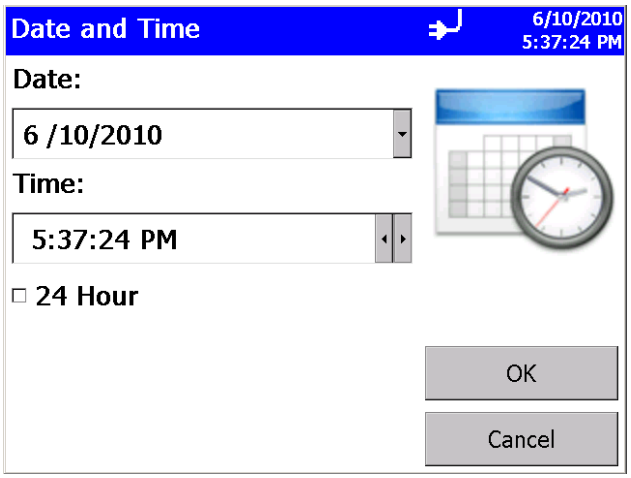
Device Setup Screen

Use this screen to access screens that let you set or change the date and time, set visual parameters of the display, set up communications, set regional features, and get system information such as software version, etc.



Date and Time Screen

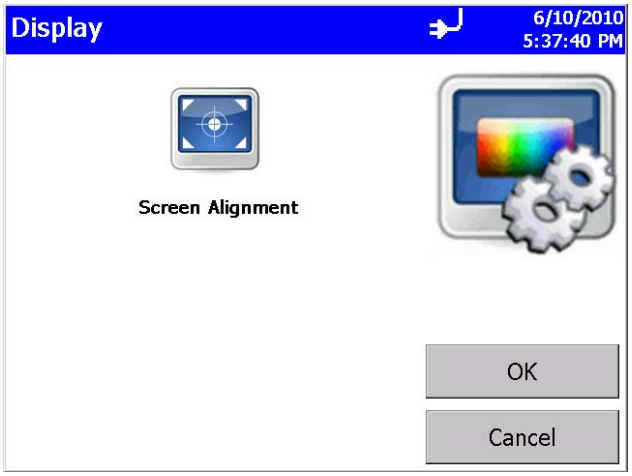
This screen lets you set the current date and time and set the date format. Press **OK** when finished. You can select options using the arrows or tapping on the screen after the keyboard appears.



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.
24 Hour	Time display is in 24 hour format.

Display Screen

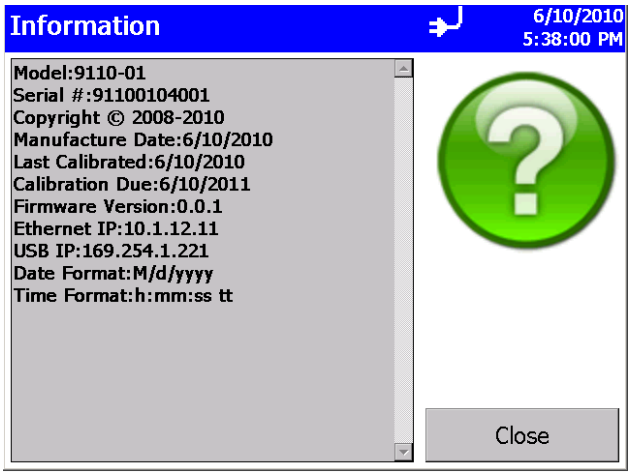
This screen lets you set or change visual parameters



Field	Description
Screen Alignment	Press this item to reset the screen alignment, and follow the directions on the alignment screen.

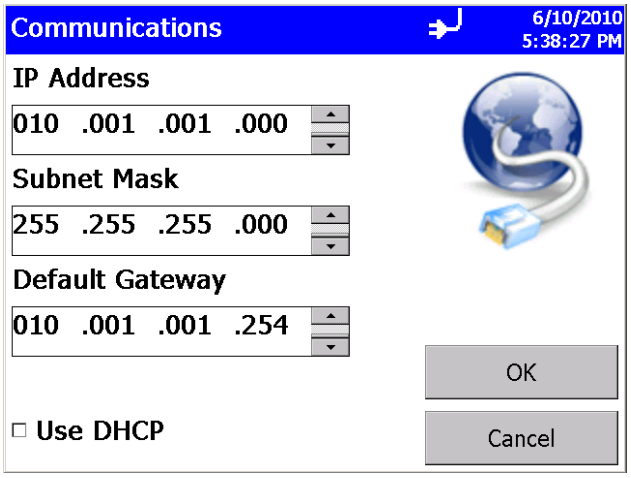
Information Screen

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



Communications Screen

This screen lets you configure the IP address, subnet, and default gateway to which the instrument belongs.



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.

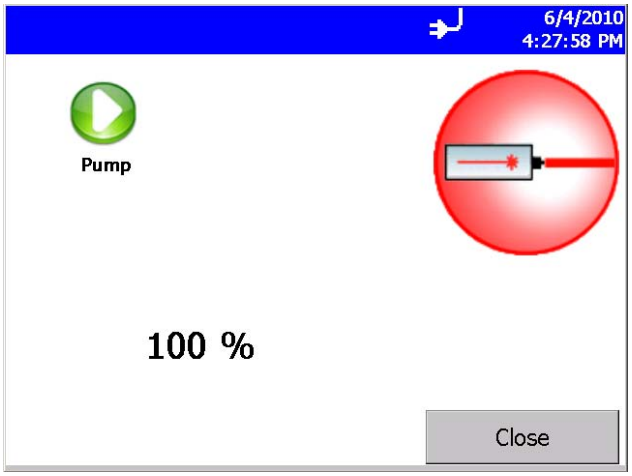
Regional Screen

This screen lets you set the language in which the on-screen dialog is displayed and your regional format for numbers.

Field	Description
Language	Select the language in which you want on-screen dialog displayed; options are German, English, Spanish, French, Italian, Chinese (simplified), and Japanese.
Formats	Select the format that is commonly used to display real numbers and the date and time in your region.

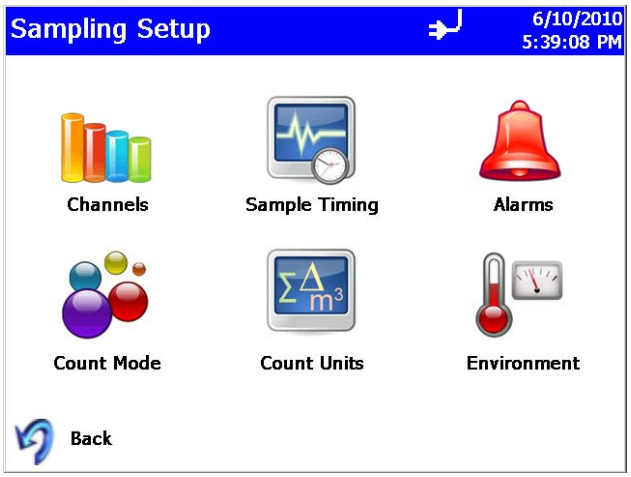
Service Screen

This screen is for use when cleaning the optics of the 9110. (See Maintenance chapter). It provides a current indication of the laser level relative to when it was measured at the factory (100% is the factory level). It also allows you to turn the pump on and off.



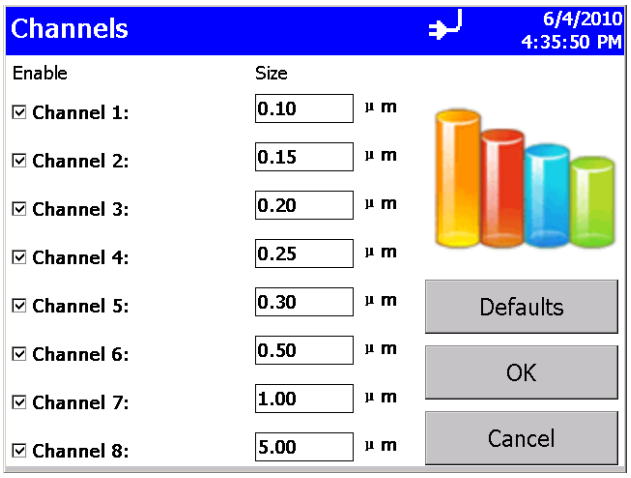
Sampling Screen

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, count units, environment, and alarm thresholds.



Channels Screen

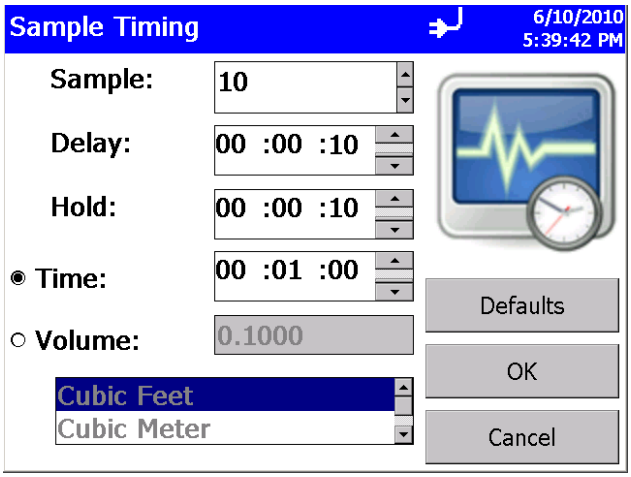
This screen lets you choose the channels that are enabled . Press **OK** when finished.



Field	Description
Enable	Select the channels you want to view on the main display.
Size	Channel size boundaries are shown. These are fixed and cannot be changed.

Sample Timing Screen

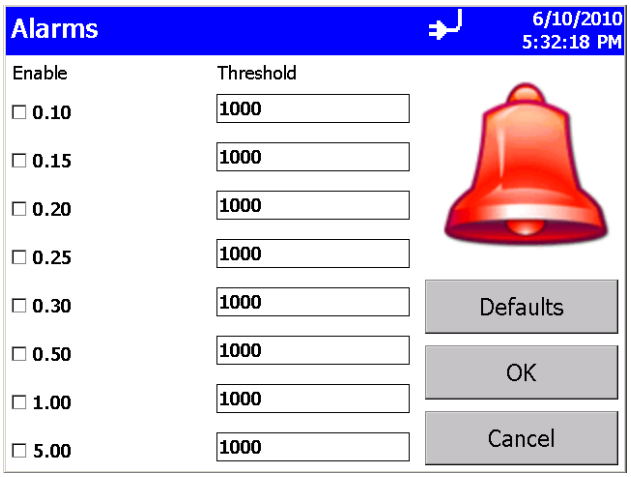
This screen lets you select parameters for sampling. Use the up and down arrows or the on-screen keyboard to change or enter information. These parameters are only valid when the particle counter is running in Automatic mode. Press **OK** when finished.



Field	Description
Sample	Sample is the total number of samples you want collected. In Automatic mode, a Count value of 0 causes 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 (i.e., Start 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 Cubic Liters for measurement using the arrows. You can only choose Volume or Time, not both.

Alarms Screen

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



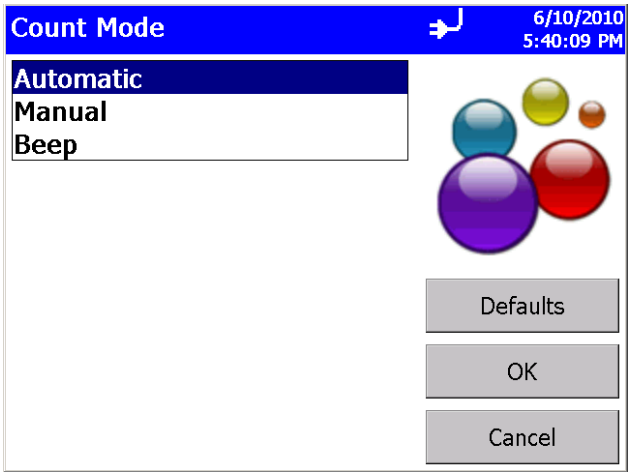
Field	Description
Enable	Select the channels on which you want to enable alarms.
Threshold	To change the threshold for any channel, click the up and down arrows for that channel or use the on-screen keyboard to change its value. The threshold value units use the current display Count Units (see Count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

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.

Count Mode Screen

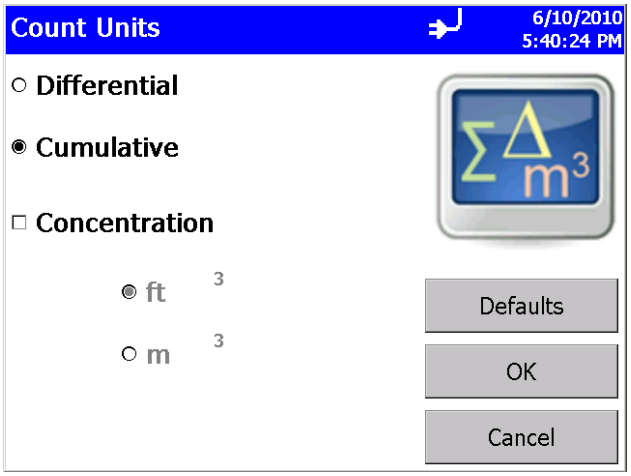
Use this screen to set the sample count mode. Press **OK** when finished.



Field	Description
Automatic	If you select this mode, the particle counter starts counting in automatic mode when you press the start button according to the setting on the Sample Timing Screen.
Manual	If you select this mode, the Model 9306 starts sampling immediately when you press the start button and stops at the end of the sample time, which is configured on the Sample Timing Screen.
Beep	If you select this mode, the particle counter starts sampling data immediately and beeps whenever the threshold for the smallest bin is reached, as specified in Alarms Screen. This can be very useful when searching for leaks, especially around filters. If this mode is selected, Display mode is set to Particle Counts while in Beep mode.

Count Units Screen

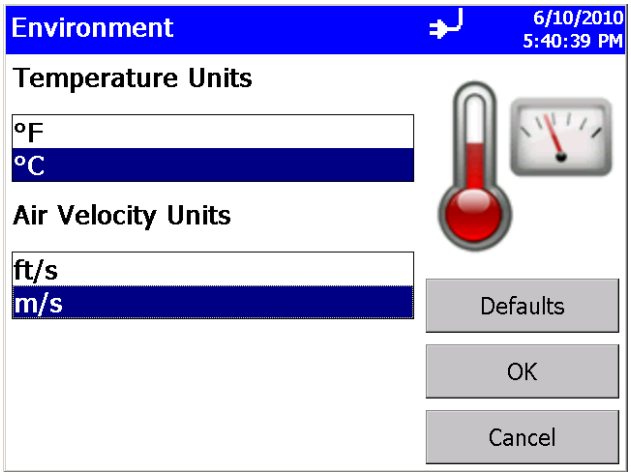
This screen lets you set the way in which particle concentration information is displayed.



Field	Description
Differential	Select to display particle concentration as a differential (the total number of counts is the number of particles *between* bin sizes).
Cumulative	Select to display particle concentration as cumulative (the total number of counts includes all particles larger than the bin size).
Concentration	Display concentration in per ft^3 or per m^3. If Beep mode is selected, display of concentration values is not allowed.

Environment Screen

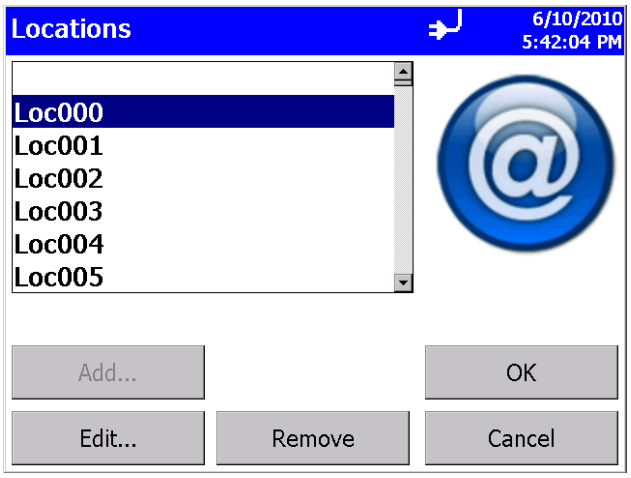
Use this screen to set the units for temperature, which is displayed on the Main and Data Tabs, and the printouts when a humidity and temperature probe is hooked up to the instrument.



Field	Description
°F	Display temperature in degrees Fahrenheit.
°C	Display temperature in degrees Celsius.
ft/s	Display velocity in feet per second.
m/s	Display velocity in meters per second.

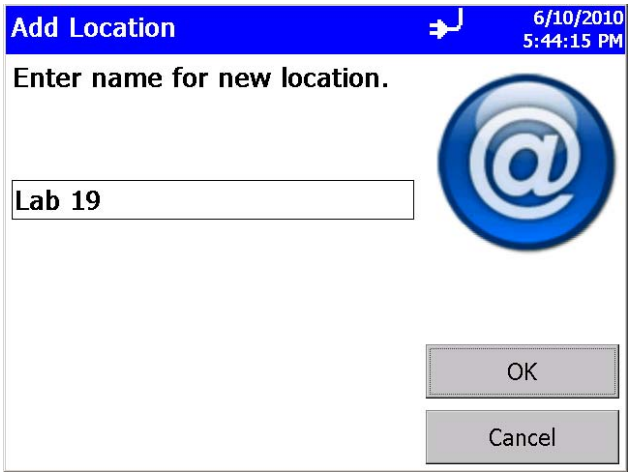
Locations Screen

Associating collected samples with labeled locations can help keep your data organized. The particle counter allows you to create up to 250 labeled locations (up to 10 characters in length). Use this screen to add, remove, or modify a location names to the list of locations.



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 (empty location can be edited). Click **OK** when finished.

To add a location, click on the blank selection at the top of the list and 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.

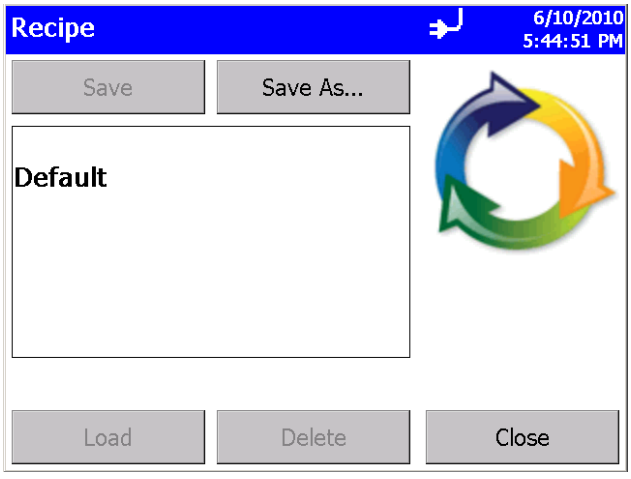


To remove a location, click on location to be removed and click the **Remove** button.

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

Recipe Screen

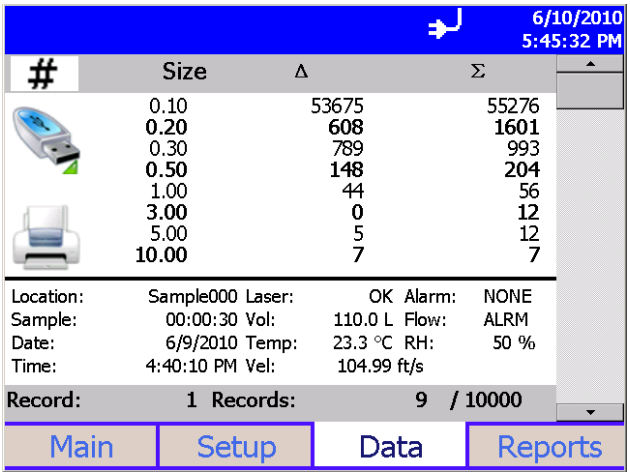
Use this screen to load and save recipes. Recipes let you save a group of settings (recipe) that you use over and over so you don’t have to reset individual settings. There may be up to 100 recipes stored in the unit.



Field	Description
Save	If you select a name in the box (highlighted) when you select **Save**, the recipe is saved over the selected file name (no dialog pops up asking for a file name). If no name is selected (highlighted), you are asked for a file name and no Recipe name is currently selected. **The settings/parameters that are saved include:** For each channel (1-6): • Alarm setting (on/off) • Alarm threshold (value) • Channel setting (enabled/disabled) • Channel threshold (value) 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 reverse setting (if supported) • 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

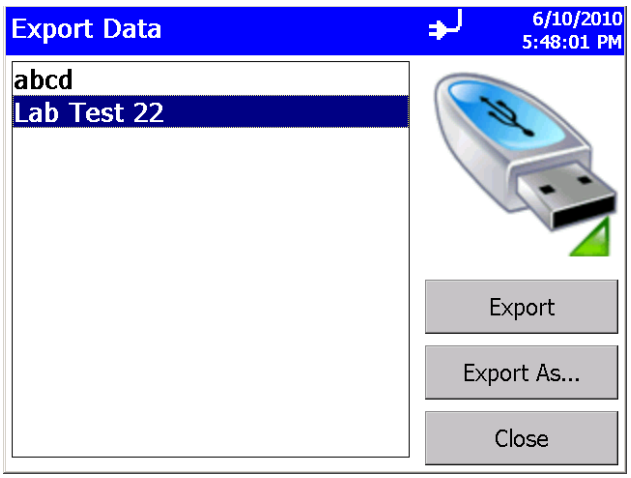
The Data tab lets you preview data that has been collected. Use the elevator (slide) on the right to scroll though the records. The record number is displayed at the bottom of the tab. As each record displays, its data and relevant parameters are displayed.



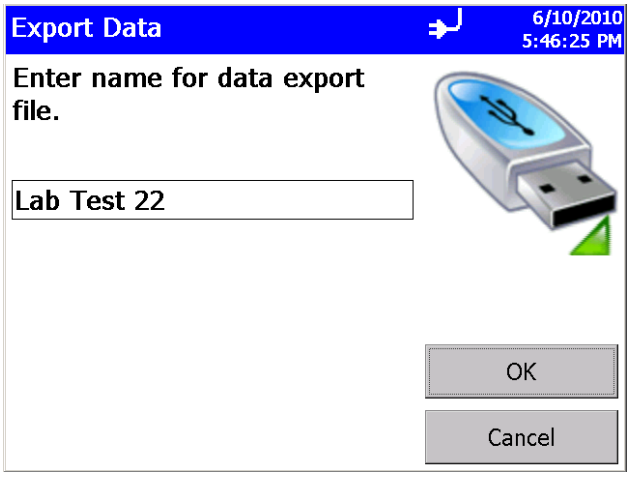
Field	Description
#, ft^3, m^3	Button used to change between counts and concentration displays.
Size	Channel size.
Δ	Differential concentration.
Σ	Cumulative concentration.
	Export the data to a flash drive. See Export Data below.
	Print data to the optional printer. See Print Data below
Location	Location 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.
Temperature	Temperature at the end of the time the data was collected (if probe connected during sampling).
Humidity	Humidity level at the end of the time the data was collected (if probe connected during sampling).
Flow	Status of the flow. Options are: OK or ALRM OK indicates the flow rate is good; ALRM indicates flow rate is below the defined setting.
Alarm	Alarm threshold was triggered (YES) or not (NONE).
Laser	Status of the laser. Options are: OK or SRVC.
Vol	Volume of air that was sampled.

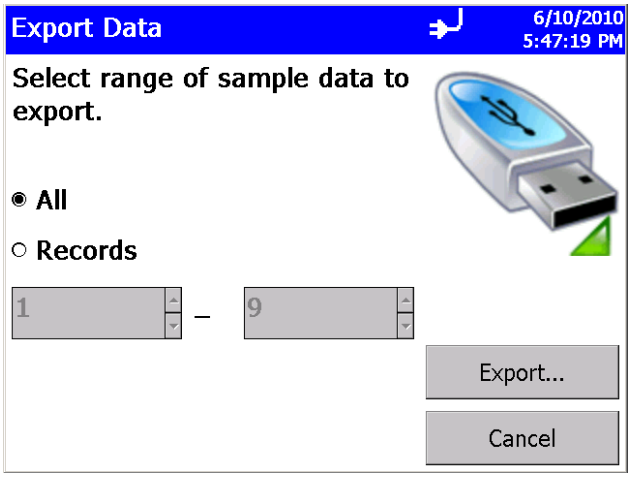
Export Data Screen

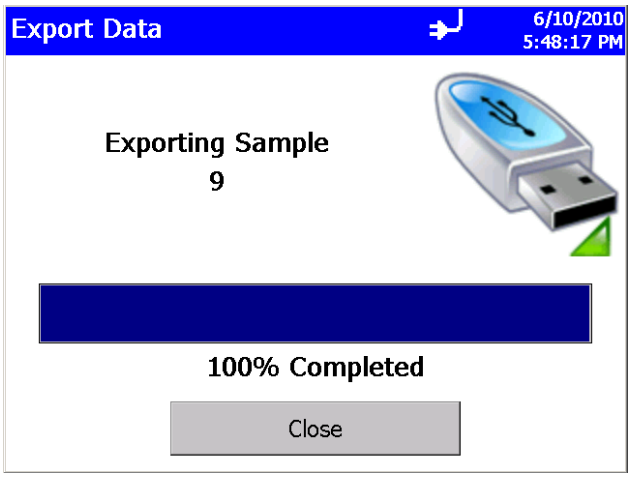
The export button lets you export sample data to a flash drive. You will be able to select the name of the file and range of data to export.



Field	Description
Export	If you select a name in the box (highlighted), the data is exported to the selected file name (no dialog pops up asking for a file name). If no name is selected (highlighted), you are asked for a file name.
Export As	Always asks for a file name to which the data will be saved.

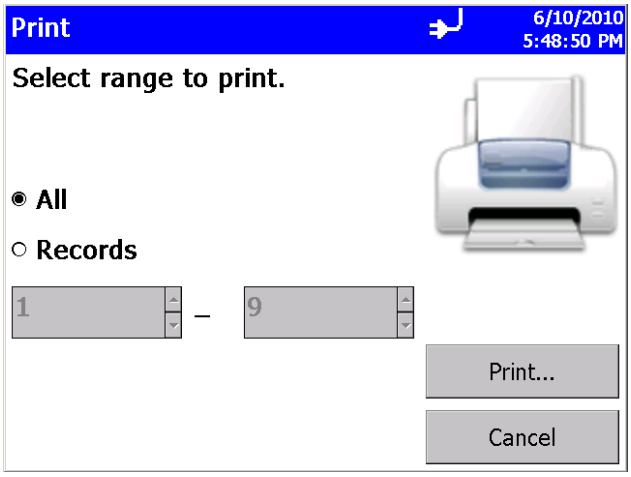




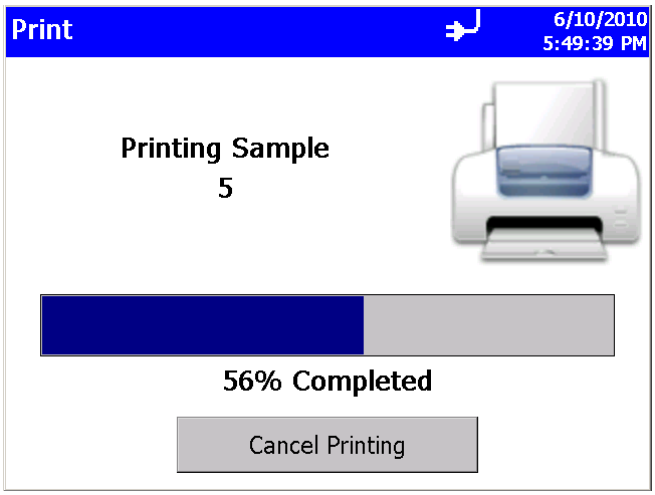


Print Data

The print button allows a range of sample data to be printed using the optional 8930 external printer.



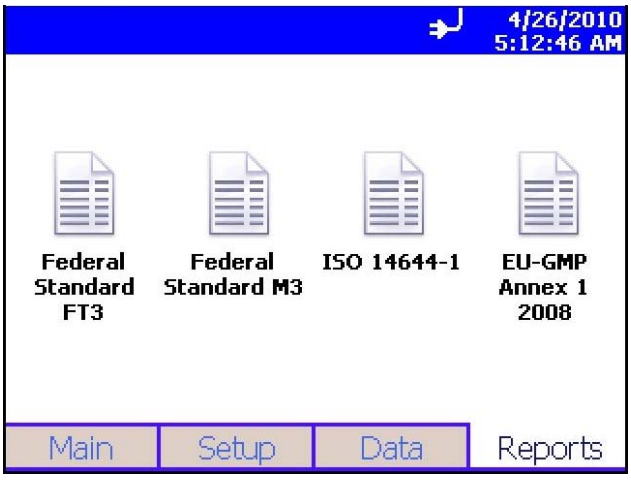
The print data screen will show progress on the current selected range of sample data to be printed. Press the **Cancel Printing** button to cancel the rest of the print job.



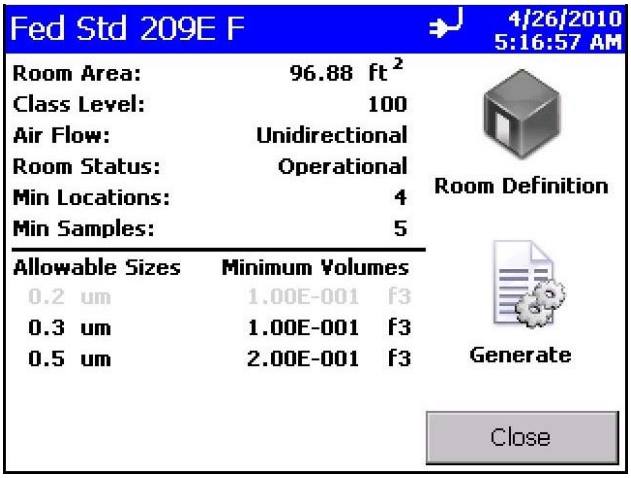
You will have a chance to preview the printout before actually printing to paper.

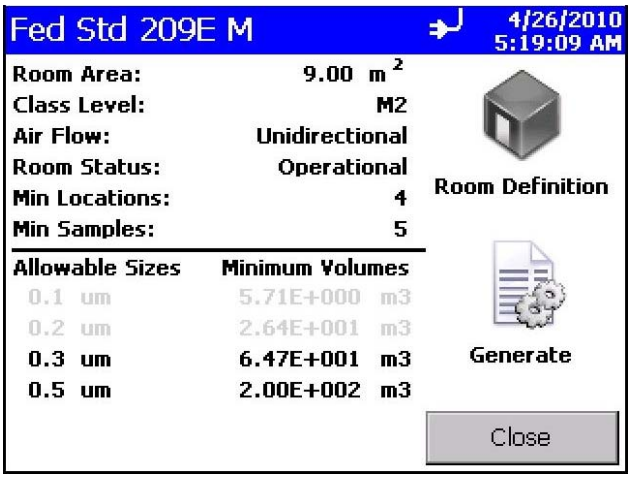
Reports Tab

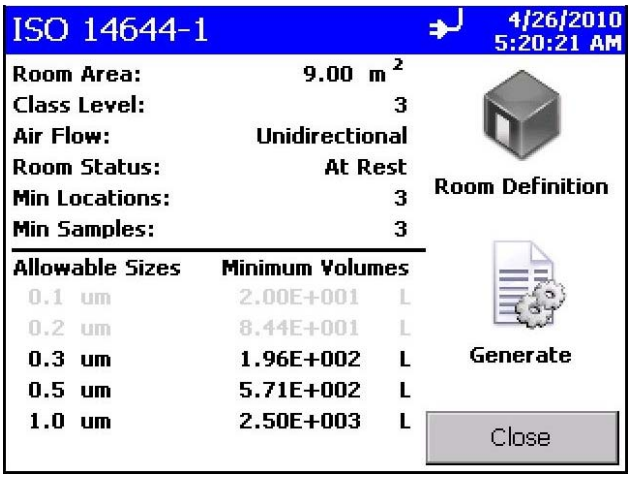
Use this screen to select various standard reports for viewing and printing. Use the Room Definition icon to view or change specific values for the room, and the Generate icon to generate reports for viewing or printing.

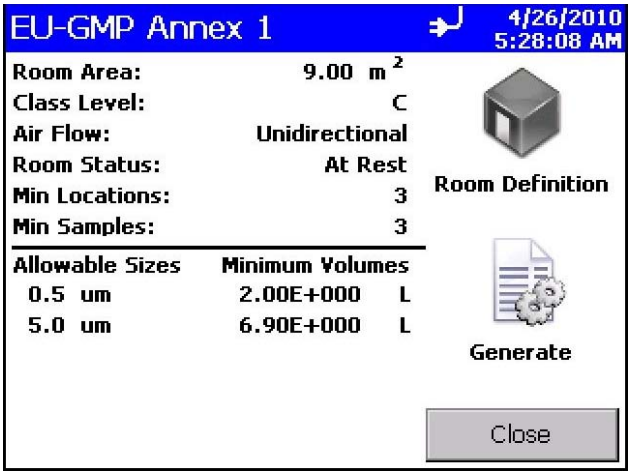


The standard reports are shown below:





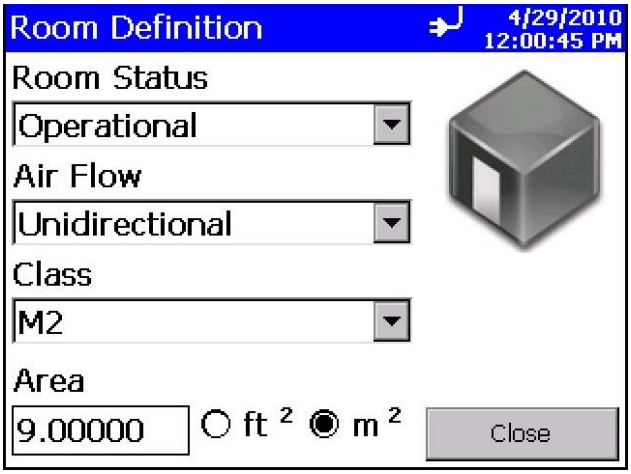




Field	Description
Room Area	Displays the area of the room in ft^2 or m^2.
Class Level	Depends on the report definition, see below.
Air Flow	Displays the airflow characteristics of the room.
Room Status	Displays the status of the room. See Room Definition Screen below.
Min Locations	Displays the minimum 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	Allowable channel sizes for the selected Class Level for that Standard.
Room Definition	Press to set definitions for the room. (See Room Definition Screen below.)
Generate	Press to begin generating a report that you can view on-screen or print. (See Generate Screens below.)

Room Definition Screen

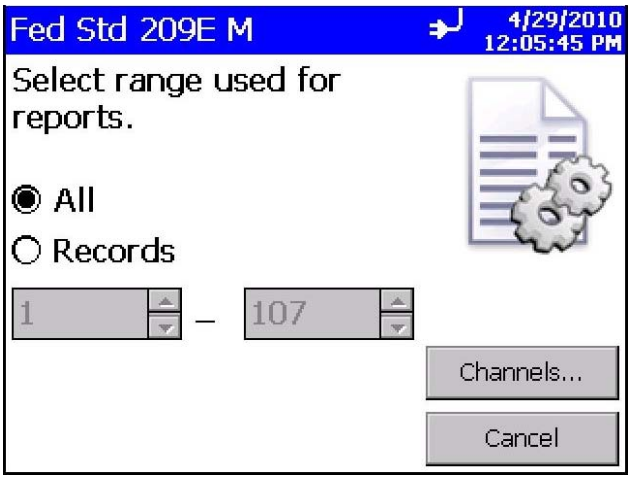
Use this screen to define specific values for the room. Press **OK** when finished.



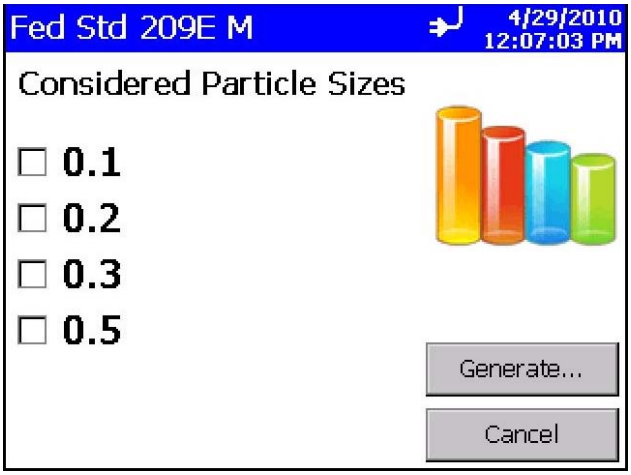
Field	Description
Room Status	Select the room status: As Built, At Rest, or Operational.
Air Flow	Select the air flow: Unidirectional or Non-unidirectional.
Class	Select the class of the room: The class is dependent on the standard: FED FT3: 1, 20, 100,1000,10000, 100000 FED M3: M1.0, M1.5, M2.0, M2.5, 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^2.

Generate Screens

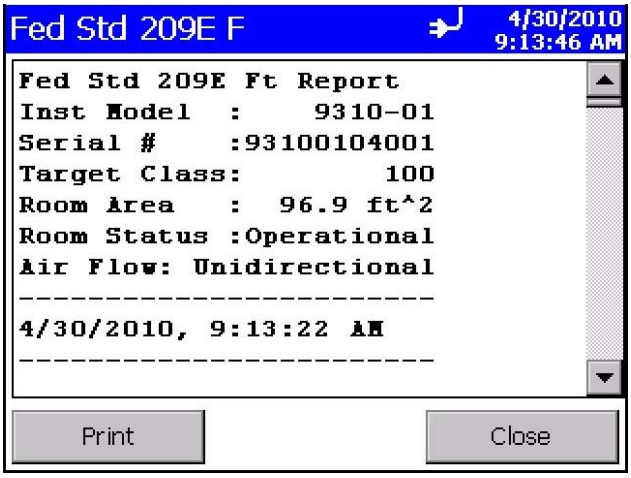
When you press the Generate icon from any of the report screen, the following screen is displayed to let you select either all records or a range of records to generate the report. After selecting the desired records, press the **Channels**..button.



After you select **Channels...** the following screen is displayed. Select the channels (particle sizes) to include in the report and then press **Generate...**



The generated report is displayed on the screen and may be viewed there. It can also be printed using the optional 8930 printer (must be attached) by pressing the **Print** button.

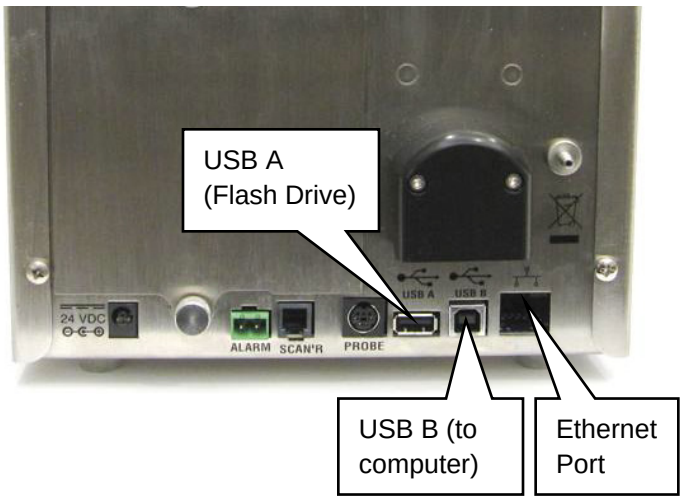

Fed Std 209E F
4/30/2010
9:13:46 AM
Fed Std 209E Ft Report
Inst Model : 9310-01
Serial # :93100104001
Target Class: 100
Room Area : 96.9 ft^2
Room Status :Operational
Air Flow: Unidirectional
4/30/2010, 9:13:22 AM
Print
Close

CHAPTER 4

Data Handling

There are three basic ways to get data from the AEROTRAK™ Portable Airborne Particle Counter:

1. Data download to a USB Flash Drive.
2. USB port connection to a computer using TRAKPRO™ Lite.
3. Ethernet connection to a TSI FMS Server.



USB Data Download

The Model 9110 AEROTRAK™ Portable Airborne Particle Counter is equipped with a USB A host drive that will allow for the downloading of stored data to a USB flash drive (also commonly called a USB thumb drive). To download data, attach a flash drive to the USB A host port and follow the instructions in the operation section of this manual. The data is downloaded in XML format that can be opened in Microsoft Excel® version 2003 or greater. The data files can also be opened in the latest versions of OpenOffice™.

USB Computer Communication

The Model 9110 AEROTRAK™ Portable Airborne Particle Counter is equipped with a USB compatible to USB B cable for connection to a PC. The cable plugs into the right side of the instrument. Data from the particle counter can be downloaded to a personal computer, through TRAKPRO™ Lite and recipes can be uploaded to the particle counters using the TRAKPRO™ Lite software.

Installing Software

See the *TRAKPRO™ Lite Software (version 2.2 or later) User's Guide (*P/N 6002796) on CD (P/N 7001384) for installation instructions.

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.

CHAPTER 5

Maintenance

This chapter contains maintenance and troubleshooting solutions for the Model 9110 AEROTRAK™ Portable Airborne Particle Counter.

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. Cleaning can be done without removing the instrument case.

Maintenance

Cleaning the Optical Surfaces of the Laser Bench

There are two optical surfaces on the laser bench for the AEROTRAK™ particle counter that may require cleaning. The two surfaces are the external mirror and the AR-coated window on the laser. If the Service indicator  is displayed, the laser bench will require cleaning.

The external mirror and AR-coated window help define the laser cavity. The cleanliness of the optics has a direct effect on the power of the cavity. The laser reference value (shown in the service screen) is a relative measurement of the power of the cavity.

The following items are needed to clean the optics:

- Small Phillips-head screwdriver (#1)
- Cotton swabs
- Spectra Photo grade Acetone

WARNING

Keep acetone away from the laser bench and from the high voltage areas on the laser bench. Also do not apply acetone to the touch screen. The surface finish will be damaged.

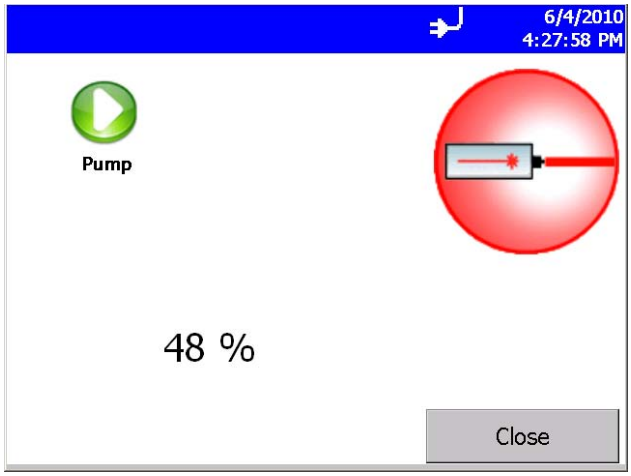
WARNING

Do **not** touch any area on the laser bench marked High Voltage and do **not** touch any part of the laser tube or any part extending from the laser tube.

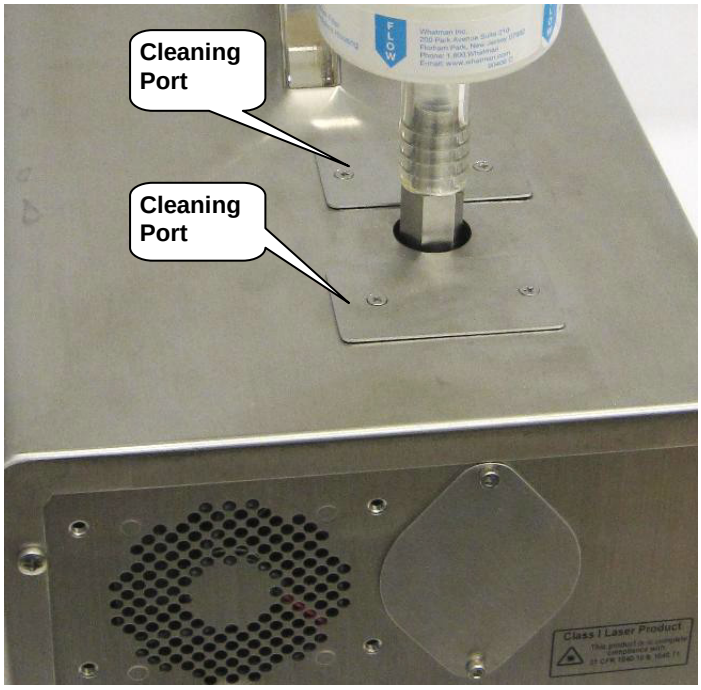
Note: *The reference voltage varies during the warm-up of the instrument. If the sensor has been shut down for a period of time, allow at least 30 minutes to warm up. Make sure a HEPA filter is attached to the inlet before turning it on. After the instrument has been allowed to warm up, the following procedure can be used to clean the laser window (located next to the laser tube) and the external mirror (located at the back of the sensor).*

Cleaning Procedure

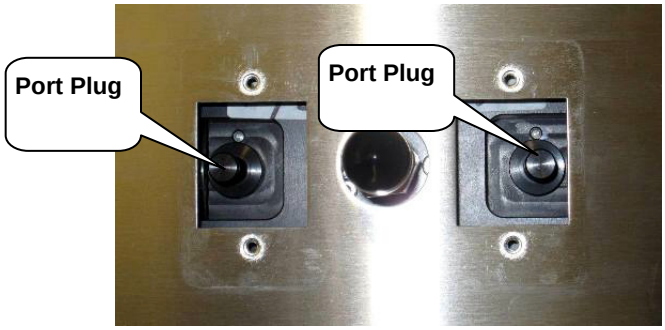
1. Make sure a HEPA filter is attached to the inlet and the instrument has been turned on and warmed up for at least 30 minutes.
2. Access the Setup tab on the main screen and select **Device**, then **Service**. The screen below should be shown. The number shown as a percentage is the ratio of current laser power to the baseline recorded when the instrument was last serviced (ideal is 100%). If measured laser reference power is less than 50% of the original value, the service icon is shown (on the main screen). However, the optics may require cleaning even if the service icon is not on.
3. Turn the pump on by touching the pump icon. This will purge any particle out of the instrument. Let it run for 30 seconds and then turn it off again.

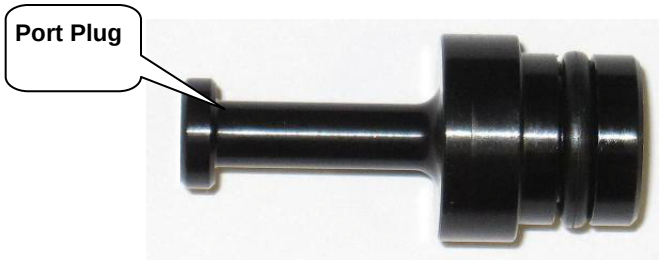


4. Remove the Phillips-head screws from the access covers located on the top of the particle counter.



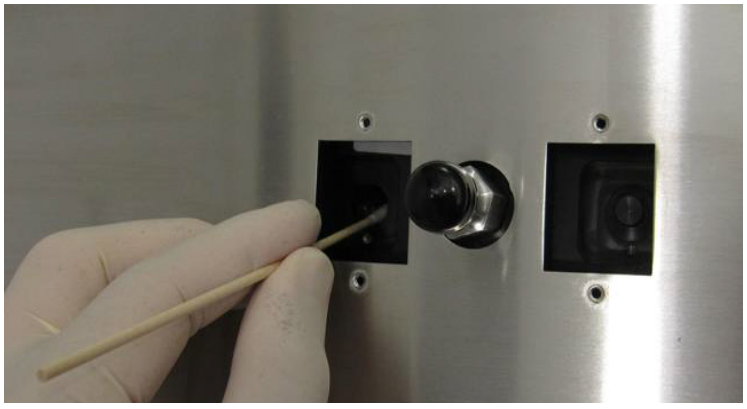
5. Carefully remove one of the port plugs. You may need to use a twisting and pulling motion as the plugs have O-rings around them. Note the present Laser Reference value on the screen.



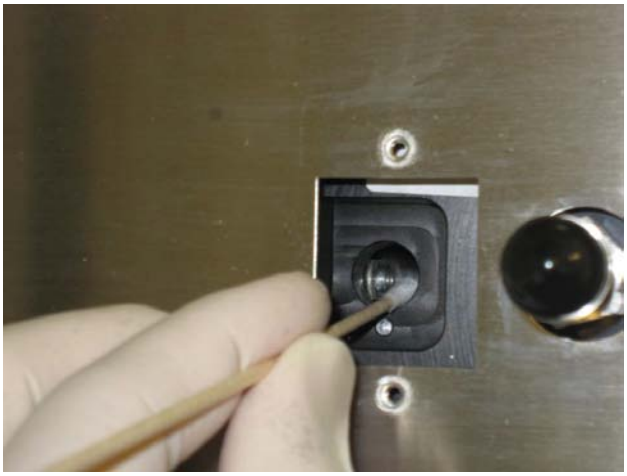


6. Look into the open cleaning port. Really bright sparkles on the optical surface indicate dust or debris on the surface.

7. Pour a small amount of acetone into a clean container. Wet a cotton swab with a small amount of acetone. Shake off the excess. The swab should be moist, not wet. Using the swab, clean one of the optical surfaces using gentle pressure and swiping across the surface in a single motion. The laser light will appear to be off during this cleaning, and come back on after you remove the cotton swab from the beam path. Discard the swab. This process will take single wipes with many swabs.

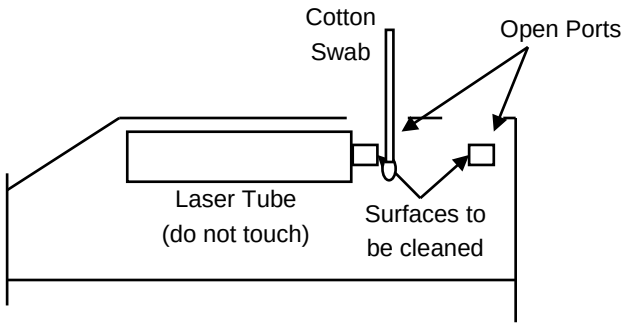


WARNING
Use each cotton swab for one wipe only. Do **not** put the used swab back into the acetone as this will contaminate the acetone.



***Note**: Ambient light may affect the voltage reading. The cleaning ports may need to be installed in order to get an accurate reading.*

There is one surface in each port that should be cleaned. For the port closest to the 9110 display, the surface to be cleaned is vertical, towards the display, and is about a 6 mm in diameter. For the port closes to the back of the 9110, the surface to be cleaned is vertical, towards the back of the instrument, and is about 6 mm in diameter.



8. Note the present Laser Reference value on the screen. If the optic does not have any more bright sparkles and value has risen, replace the cleaning port onto the block. Be sure that the port is in correctly and seated well. Ensure the zero filter is still tightly secured. Turn on the pump again for 20 to 30 seconds.

9. Repeat the above procedure on the other optical surface. Be careful ***not*** to turn the pump on when a cleaning port is removed.

10. Continue cleaning the surfaces and checking the Laser Reference value until it is within 90% of the Initial Laser value. In this case, the optics are clean (it is normal to have some

oscillation in the value). If the Laser Reference value ***cannot*** be raised to this value, contact TSI.

11. Once the particle counter is clean, replace the cleaning port plug. Turn on the vacuum and monitor the Laser Reference Voltage to make sure it remains stable. If the voltage drops significantly, stop the vacuum and repeat the cleaning steps until the optics are clean.

Cleaning the Instrument Housing

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.
	The laser power is low. The instrument needs cleaning.	Clean the optics.
	Internal parts have been damaged because instrument was stored at a temperature greater than 122 °F (50 °C).	Return to factory or factory-authorized service centers for service.
	Instrument has contamination on the optics due to condensation or excessive loading.	Return to factory or factory-authorized service centers for service.
	Laser or pump control is damaged.	Return to factory or factory-authorized service centers for service.
	Unit is due for calibration.	Return to factory or factory-authorized service centers 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 or more excessive bumps or jolts, and electronic noise is inducing false counts.	Return to factory or factory-authorized service centers for service.
	A leak has developed in the aerosol flow path.	Return to factory or factory-authorized service centers for service.
	Internal optics have become dirty.	Return to factory or factory-authorized service centers for service.
	HEPA filter efficiency is not sufficient for a dirty (non-clean room) room.	Add multiple HEPA filters in series to improve filtration.
	The inlet flow is obstructed. The instrument is pulling too much volume from the purge pump.	Check the sample flow rate.
	Strong radioactivity source nearby.	Move the instrument away from the radiation source.
Battery does not charge	The unit must be turned on or in standby/ battery-charge mode.	Turn on unit. Green LED by on/off button should be lit.
LOW BATTERY ERROR 	Low battery.	Recharge battery or connect AC cord.

Symptom	Possible Cause	Corrective Action
FLOW ERROR 	Instrument was unable to control flow rate [e.g., if sample tubing used is too long (greater than 12 m)].	Restart measurement.
	Pressure drop across inlet may be too large.	Lower pressure drop across inlet by using larger diameter tubing, less tubing, and/or adding a bleed valve.
	Inlet tubing kinked	Straighten tubing
	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.	The laser surfaces need to be cleaned (see instructions in Maintenance above).
	Optical path blocked.	Return to factory for service.
	Nozzle is misaligned. Fiber attached on the nozzle tip.	Contact TSI and return to factory.
	The laser power is low only when the pump is on.	Return to factory or factory-authorized service centers for service.
	Detector board damaged. Laser power is normal.	Return to factory or factory-authorized service centers for service.

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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

TSI Instruments Singapore Pte Ltd
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Singapore 368324

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Fax: +65 6595-6399
E-mail: tsi-singapore@tsi.com

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High Wycombe, Bucks
HP12 3RT
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Fax: +44 (0) 149 4 459700
E-mail: tsiuk@tsi.com
Web: www.tsiinc.co.uk

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Singapore 368324

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Fax: +65 6595-6399
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Fax: +49 241-52303-49
E-mail: tsigmbh@tsi.com
Web: www.tsiinc.de

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HP12 3RT
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Fax: +44 (0) 149 4 459700
E-mail: tsiuk@tsi.com
Web: www.tsiinc.co.uk

TSI France Inc.
Hotel technologique
BP 100
Technopôle de Château-Gombert
13382 Marseille cedex 13
FRANCE

Telephone: +33 (0)4 91 11 87 64
Fax: +33 (0)4 91 11 87 65
E-mail: tsifrance@tsi.com
Web: www.tsiinc.fr

Returning for Service

Visit our website at http://rma.tsi.com and complete the on-line "Return Merchandise Authorization" form or call TSI at 1-800-874-2811 (USA), (651) 490-2811, or 001 651 490-2811 (International) for specific return instructions.

Customer Service will need the following information:

- 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. This instrument is very fragile and must be packed in a manner appropriate for a precision instrument.

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APPENDIX A

Specifications

All specifications meet or exceed ISO 21501-4 and JIS B9921 and are subject to change without notice.

Specification	Description
Size Range	0.100 to 10.0 µm
Particle Channel Sizes	9110-01: 0.10, 0.15, 0.2, 0.25, 0.3, 0.5, 1.0, 5.0 µm
Size Resolution	<15% @ 0.2 µm (per ISO 21501-4)
Counting Efficiency	50% at 0.100 µm; 100% for particles >0.15 µm (per ISO 21501-4 and JIS)
Concentration Limit	>40,000/ft3 at 5% coincidence loss
Light Source	Enhanced active cavity HeNe laser
Zero Count	<1 count per 5 minutes (per ISO 21501-4 and JIS)
Flow Rate	28.3 L/min (1.0 CFM) ±5% accuracy (meets ISO 21501-4 and JIS B9921)
Flow Rate Control	Electronic, automatic closed loop (patented* flow control technology)
Calibration	NIST traceable using TSI calibration system
Calibration Frequency	Recommended minimum of once per year
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
Exhaust	Internal HEPA filter
Communication Mode	Modbus® RTU over Ethernet or USB
Data Storage	10,000 sample records: includes date, time, eight particle channels, flow, ID, and sample volume; transferable via USB data download or TRAKPRO™ Lite software
Audible Alarm	Built-in; >85 dB at 1 meter (adjustable)
Status Indicator	Low battery, flow, laser
Alarm Output	Dry contacts, normally closed when alarm is engaged
Alarm Limits	Programmable for all particle channels
Display	VGA 14.5-cm touch screen display
Languages	English, German, French, Spanish, Japanese, Chinese (simplified), Italian
Software	Compatible with TRAKPRO™ Lite and FMS 5 software
Printer	Built-in thermal printer (also available without printer)
Printer Output	Prints in all available languages

Specification	Description
Environmental Sensor Interface	Supports TSI Probe Models: 960, 962, 964, 966 (air velocity/temp/RH) and Temp/RH probe
Unit ID	Configurable IP address
Security	2-level password protection to lock out usage and configuration
Location ID	Up to 999 Locations; 16 characters long
Reports	Provides Pass/Fail on ISO 14644-1, and FS209E reports
External Surface	Stainless steel
Dimension (H x W x D)	23.6 cm x 20.6 cm x 52.2 cm (9.3 in. x 8.1 in. x 20.5 in.)
Weight	11.14 kg without battery; 12.70 kg with battery
Power	110 to 240 VAC, 50 to 60 Hz universal power supply
Battery	Removable/rechargeable Li-Ion battery, up to four batteries
Battery Life	Up to 4 hours continuous use
Recharge Time	3.5 hours (when idle)
Standards	ISO 21501-4, CE, JIS B9921
Warranty	Two years, extended warranties available
Operating Range	10° to 35°C, 20% to 95% noncondensing
Storage Range	0° to 50°C, up to 98% RH noncondensing

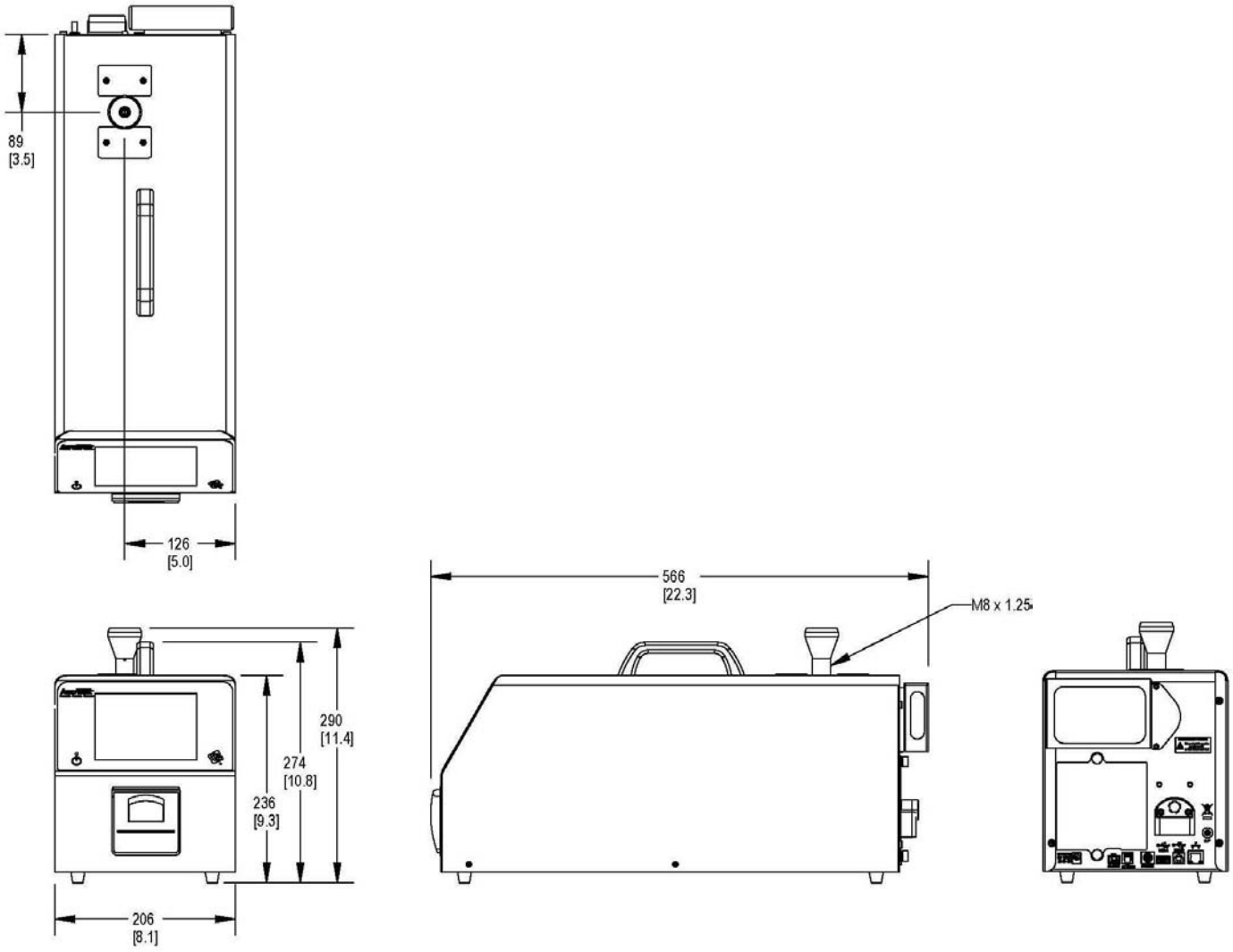
*Patent Number 6,167,107

Compliance

CE Marking	EN61326 / EN 55011, Class BA: Radiated Emissions EN61326 / EN 55011, Class BA: Conducted Emissions EN61000-3-2: Harmonics EN61000-3-3: Voltage Fluctuations EN61000-4-2: Electrostatic Discharge Immunity EN61000-4-3: Electromagnetic Field Immunity EN61000-4-4: Burst Immunity EN61000-4-6: Conducted PS Immunity EN61000-4-5: Surge Immunity EN61000-4-8: Rated Power-Frequency Field Immunity EN61000-4-11: Voltage Dips\Short Interruptions Immunity
RoHS Marking	Yes
Laser Safety	Complies with 21 CFR 1040.10 and 1040.11

Dimensional Diagram

Dimensions are given in millimeters with inch equivalents in parenthesis.



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France	Tel: +33 491 11 87 64	E-mail: tsifrance@tsi.com	Website: www.tsiinc.fr
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Contact your local TSI Distributor or visit our website **www.tsi.com** for more detailed specifications.

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