

# AEROTRAK® HANDHELD AIRBORNE PARTICLE COUNTER MODEL 9303

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OPERATION MANUAL

P/N 6002277, REVISION J  
DECEMBER 2017



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Printed in U.S.A.

# AEROTRAK®

## HANDHELD AIRBORNE PARTICLE COUNTER

### MODEL 9303

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OPERATION MANUAL

P/N 6002277, REVISION J  
DECEMBER 2017

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# Manual History

The following is a manual history of the AeroTrak® Handheld Airborne Particle Counter, Model 9303 Operation Manual (P/N 6002277).

Revision	Date
A	November 2008
B	January 2009
C	June 2009
D	July 2010
E	September 2010
F	February 2011
G	November 2012
H	February 2016
J	December 2017

# Warranty

**Part Number**

6002277 / Revision J / December 2017

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**Address**

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

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(effective April 2014)

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- 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;
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- c. 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;
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# Safety Information

This section gives instructions to promote safe and proper handling of the AeroTrak® Handheld 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.

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## Laser Safety

- The Model 9303 Handheld 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, invisible 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)	 <p><b>AeroTrak APC 9303-D1</b>  Channels: 0.3/0.5/3um, 0.1CFM  COMPLIES WITH 21 CFR 1040.10 AND 1040.11</p> <hr/> <p>Manufactured : February 2011</p>  <p>1926311078050</p> <p>0V 2A 0-20  TBI Incorporated  www.tbi.com  950 Cardigan Road  Shoreview, MN 55126, USA</p> <p><b>CE</b>  Made in USA</p>
2. Laser radiation label (internal)	<p><b>DANGER!</b>  INVISIBLE LASER RADIATION  WHEN OPEN. AVOID DIRECT  EXPOSURE TO BEAM  WARNING: NO USER SERVICABLE  PARTS INSIDE. REFER SERVICING  TO QUALIFIED PERSONNEL</p>
3. Laser radiation symbol label (internal)	
4. 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



### **C a u t i o n**

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



### **W A R N I N G**

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: [answers@tsi.com](mailto:answers@tsi.com)

Web site: [www.tsi.com](http://www.tsi.com)

## CHAPTER 1

# Introduction and Unpacking

The AeroTrak® Model 9303 Handheld Airborne Particle Counter (particle counter) is a lightweight, handheld particle counter with a backlit LCD display. It operates on the included lithium-ion battery or AC power.


This model has a 0.1 CFM (2.83 L/min) flow rate and counts in user-adjustable bin sizes of 0.3, 0.5/1.0/2.0/2.5, and 5 microns (center channel is selectable). Up to 1500 data sets can be stored and downloaded for analysis and reporting using the TrakPro™ Lite utility included with the device.









---

## Unpacking the AeroTrak Handheld 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.

**Model 9303 AeroTrak Airborne Particle Counter Parts List**

Qty.	Item Description	Part/Model	Reference Picture
1	AeroTrak Airborne Particle Counter	9303-01	

Qty.	Item Description	Part/Model	Reference Picture
1	AC power adapter and country-specific plugs	700021	
1	Isokinetic inlet	700003	
1	Battery Pack	700019	
1	Computer cable, USB A to mini-B	700036	
1	HEPA zero filter	700005	
1	TrakPro™ Lite Secure Software CD for 21 CFR Part 11 compliant data downloading (includes manuals)	7001901	
1	Operation and Service Manual	6002277	<i>Included on TrakPro Lite Secure Software CD</i>
1	Quick Start Guide	6002238	
1	Calibration Certificate	N/A	

## Optional Accessories

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

Item Description	Part/Model	Ref.
Stainless Steel Isokinetic inlet	700004	
Isokinetic probe (used with tubing)	700001 AL 700002 SS	
0.1 cfm Barb Inlet Fitting	700020	
Tubing, Superthane 1/8-inch ID x 1/4-inch OD, Clear 100 Ft Box	700009	
Light Duty Carry Case	700115	

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## CHAPTER 2

# Getting Started

This chapter provides information to help you use the Model 9303 including:

- [Installing the Isokinetic Inlet](#)
- [Providing Power](#)
- [Quick Start](#)

---

## Installing the Isokinetic Inlet

The Isokinetic Inlet smoothly accelerates air into the inlet of the instrument. To install, simply screw the probe directly onto the threaded inlet nozzle.



**Installing an Isokinetic Inlet**

# Providing Power

The Model 9303 may be powered using its internal rechargeable lithium-ion battery or through an AC power cord.

## Notes:

- When using AC power, the battery is charging when the red LED next to the power connector is on.
- Removing/changing the lithium-ion battery or disconnecting AC power does not cause the loss of data.
- You should fully charge the battery before use.



## WARNING

The battery supplied by TSI (700019) has built in protection against explosion and fire hazard. Do **not** use a substitute.



## WARNING

Do **not** use non-rechargeable batteries in this instrument. Fire, explosions, or other hazards may result.

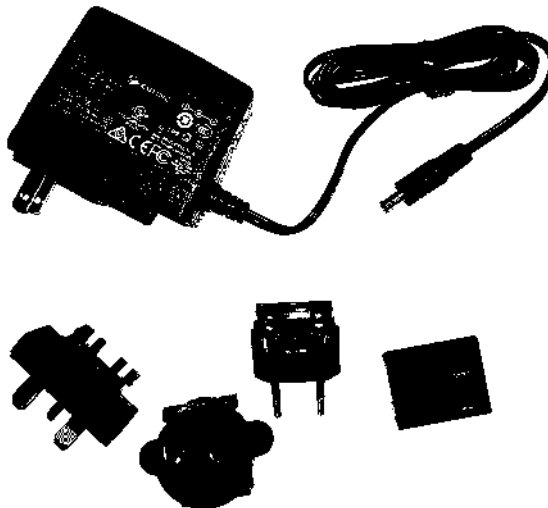
## Installing the Battery

1. The battery is shipped separately and has to be installed before use.
2. Remove the battery cover on the back side of the handle with a small, flat-blade screwdriver.
3. Connect the battery to the socket as shown below.
4. Insert the battery with the connector at the top and replace the battery cover. Make sure all wires are inside and not pinched in the cover. Do **not** over-tighten the screw.
5. Fully charge the battery before use.



## To Use AC Power

1. Remove the AC transformer parts from their package and identify the appropriate plug for your needs. Plugs are available for all common countries.



2. Remove the insert from transformer using the slide lock and tilt the insert out.



3. Tilt the appropriate plug into the transformer receptacle.



4. Make sure it locks into place.

5. Plug the DC end of the transformer cord into the counter.
6. Plug the AC end of the transformer cord into an AC outlet.
7. The Power LED lights when the battery is charging. When the Power LED is off, the battery is fully charged.
8. When the battery is charged, unplug the power supply.

---

## Quick Start

The best way to quickly get started is to refer to the printed “Quick Start Guide” included with your instrument. It will help you to quickly set up the instrument and begin sampling. Refer to the sections below for more detailed information on configuring and running the instrument.

## CHAPTER 3

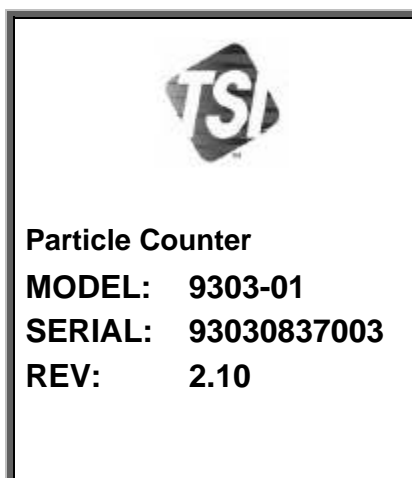
# Operation

The Model 9303 is controlled using the integral keys and the backlit display.



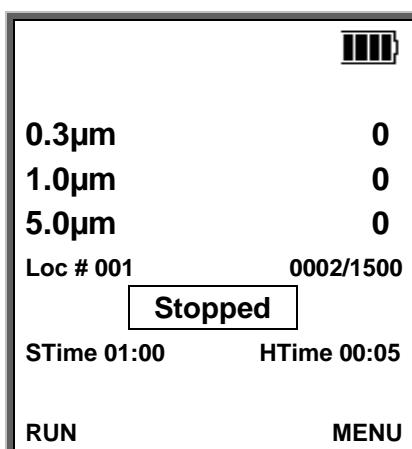
To turn on the instrument, press the **On/Off** key. A splash screen will appear for three seconds, displaying the TSI logo, model number, serial number, and firmware version number (see below).





Splash Screen

The instrument is ready for operation when the default screen (shown below) appears.



Default Screen

**Note:** To turn off the instrument, press and hold the **On/Off** key for 5 seconds. The instrument turns off.

---

## Warm-up Time

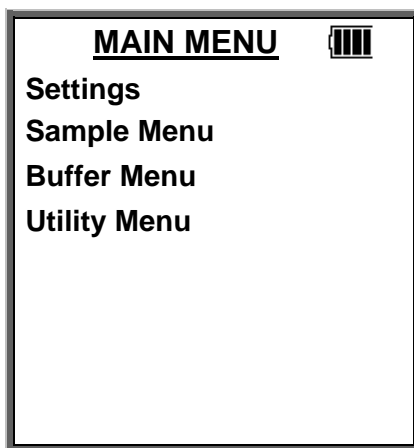
An initial warm-up period of 15 minutes is recommended before sampling with the Model 9303. The warm-up period allows time for the optics to reach a steady-state temperature. This will result in more repeatable results. Neglecting the warm-up time may result in an overestimation of particle size (approximately 10 percent). Neglecting the warm-up time will not have a significant effect on particle concentration; therefore, a zero count can still be performed without waiting for the warm-up period.

---

# Main Menu and Basic Operation

Press **Menu** on the Default Screen to display the Main Menu.

## Main Menu



### Main Menu

From the Main Menu you can select other menus:

Menu	Description
Settings	Set language, time and date, time and day format, and screen settings.
Sample	Set sample mode, cycle mode, sample time, hold time, cycle count, sample units, and channel 2 size.
Buffer	View the number of records stored in the Model 9303, display buffer records, and clear the buffer.
Utility	Adjust the pump speed, turn data logging on and off, and select the sampling location.

Each of these menus is described in the remainder of this chapter.

## Basic Operation

This section explains the basic operation for using the keypad and starting sampling.

### Using the Keypad



Use the up and down keys to highlight a menu or a menu option then:

- If left and right arrows (< >) appear at the bottom of the screen, use the left and right soft keys to select the option you want. Generally, there will be only 2 or 3 options. Soft keys change function depending on the display above them. For instance, in the picture above, the left soft key is labeled **RUN** and the right soft key is labeled **MENU**. The center soft key is not currently used.
- If no arrows appear at the bottom, press the **Enter** key to bring up a secondary window from which you can make a selection or modify a setting.

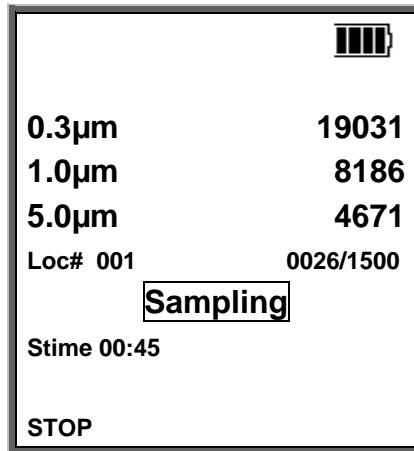
Use the up and down keys to perform operations such as increasing a value. Use the right soft key and left soft keys to move right and left.

The **ESC** key always brings you back to the previous screen.

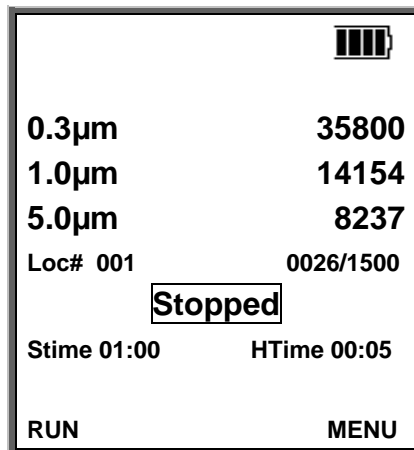


## Start Sampling

To start sampling, press the **left** soft key (below "RUN"). The Model 9303 begins collecting samples immediately if set to manual mode or according to the parameters you have set for automatic mode.

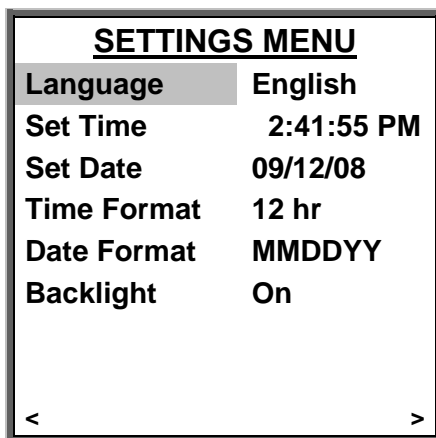


To stop sampling at any time, press the **STOP** soft key.



# Settings Menu

The Settings Menu lets you set language (supported in future), current time and date, select the time and day format, and set certain screen settings.



**Settings Menu**

The following table describes the options of this menu and the parameters you can set.

Option	Description	Parameters
Language	Use < and > to set the language in which information is displayed.	English (other languages may be offered)
Set Time	Press the <b>Enter</b> key to go to a secondary screen where you can set the current time.	Hours, minutes, seconds
Set Date	Press the <b>Enter</b> key to go to a secondary screen where you can set the current date.	Day, month, year
Time Format	Use < and > to set the time format in which time is displayed (and saved in the sample records).	12 hr; 24 hr
Date Formats	Use < and > to set the date format in which the date is displayed (and saved in the sample records).	DD/MM/YY; MM/DD/YY
Backlight	Use < and > to set whether the backlight on the display is on or off. Note that battery life is approximately 15% less with the backlight enabled.	On – backlight is always on Off – backlight is always off

# Sample Menu

The Sample Menu sets sample mode, cycle mode, sample time, hold time, cycle count, sample units, and channel 2 size.

<b>SAMPLE MENU</b>	
<b>Sample Mode</b>	<b>COUNTS</b>
<b>Cycle Mode</b>	<b>AUTO</b>
<b>Sample Time</b>	<b>01:00</b>
<b>Hold Time</b>	<b>00:30</b>
<b>Cycle Count</b>	<b>010</b>
<b>Sample Units</b>	<b>LITER</b>
<b>Chan 2 Size</b>	<b>0.5µm</b>
< >	

Sample Menu

The following table describes the options of this menu and the parameters you can set.

Option	Description	Parameters
Sample Mode	Use < and > to set the sampling mode.	Concentration (see note below); counts
Cycle Mode	Use < and > to set the sampling mode.	<b>Manual</b> – the counter will start when the RUN soft key is pressed and stop only when the STOP soft key is pressed. <b>Auto</b> – the counter will start when the RUN soft key is pressed and turn on and off automatically to follow the sample time, hold time and cycle count parameters below.
Sample Time	Press the <b>Enter</b> key to go to a secondary screen where you can set the sample time.	Minutes and seconds up to 99:59 (see note below)
Hold Time	Press the <b>Enter</b> key to go to a secondary screen where you can set the time between samples.	Minutes and seconds up to 99:59
Cycle Count	Press the <b>Enter</b> key to go to a secondary screen where you can set the number of samples to take.	1 to 999

Option	Description	Parameters
Sample Units	Use < and > to set the sampling units.	Liter; cubic feet
Channel 2 Size	Use < and > to set the bin size for channel 2. (This is the only channel that can be set to more than one value.)	0.5, 1.0, 2.0, 2.5 µm

Note	
When concentration sample mode is used with short sample times (less than 30 seconds), the concentration may not be accurate due to the poor counting and timing statistics associated with a short sample.	

## Buffer Menu

The Buffer Menu lets you view the number of records stored in the Model 9303, display buffer records, and clear the buffer.

**BUFFER MENU**

**# of Records    0035/1500**

**Show Buffer Record**

**Clear Buffer**

**Buffer Menu**

The following table describes the options of this menu and the parameters you can set.

Option	Description	Parameters
# of Records	Shows the number of sample records stored in the Model 9303.	None
Show Buffer Record	Press the <b>Enter</b> key to go to a secondary screen where you can select the record (by sample number) of the record you want to view.	Any record number (up to 1500)
Clear Buffer	Press the <b>Enter</b> key to clear all samples in the buffer. You will be asked to confirm your request.	None

BUFFER RECORD	
Record#:	0313
Date:	12/27/08
Time:	05:50:45
0.3µm	000566473
0.5µm	000534571
5.0µm	000072056
Location:	111
Sample Time:	01:00
Hold Time:	00:00
<	>

**Example of a Buffer Record**

Use the < and > softkeys to scroll through the records, Enter to go back one screen and **ESC** to go back to the Buffer Menu.

Note
If the buffer is filled to its capacity of 1500 records, the instrument will continue to count and save records but the next record after 1500 will be saved in record number 1, then 2, etc. This way the most recent 1500 records are always preserved.

## Utility Menu

The Utility Menu lets you adjust the pump speed, turn data logging on and off, and select the sampling location.

UTILITY MENU	
Pump Speed	099
Data Logging	ON
Location	120

**Utility Menu**

The following table describes the options of this menu and the parameters you can set.



### C a u t i o n

If you turn Data Logging off, no data will be saved to the buffer.

Option	Description	Parameters
Pump Speed	Press the <b>Enter</b> key to go to a secondary screen where you can increase or decrease the pump speed. (The pump may slow down with age, or it may be necessary to increase the speed if there are flow restrictions – such as long tubing). Use a flowmeter to check the flow when taking critical measurements, and adjust the pump speed as necessary.	0 to 255
Data Logging	Use < and > to turn data logging on and off.	ON; OFF
Locations	Press the <b>Enter</b> key to go to a secondary screen where you can select a location number.	0 to 250

## CHAPTER 4

# Data Handling

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### USB Computer Communication



**Mini USB Port**

The Model 9303 is equipped with a USB-compatible cable for uploading and downloading information to a PC. The cable plugs into the left side of the instrument as shown above.

---

### Installing Software

Refer to the *TrakPro™ Lite Secure Software User's Guide* (P/N 6004404) on CD (P/N 7001901) for installation instructions.

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## 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 as defined by application).
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.

---

## Cleaning the Instrument Enclosure

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

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## CHAPTER 6

# Troubleshooting

Symptom	Possible Cause	Corrective Action
Counts are too low.	<p>Instrument is being operated outside temperature or relative humidity specifications.</p> <p>Internal parts have been damaged because instrument was stored at a temperature greater than 122 °F (50 °C) or shipped with battery installed and turned on causing excessive heat.</p> <p>Instrument has contamination on the optics due to condensation or excessive loading.</p> <p>Laser or pump is damaged.</p> <p>Unit is due for calibration.</p>	<p>Operate instrument within specifications.</p> <p>Return to factory or factory authorized service centers for service.</p> <p>Return to factory or factory authorized service centers for service.</p> <p>Return to factory or factory authorized service centers for service.</p> <p>Return to factory or factory authorized service centers for service.</p>
Instrument does not turn on.	<p>On/off switch is not being pressed properly.</p> <p>Battery is dead.</p> <p>AC cord is not plugged into unit.</p>	<p>Press and hold on/off switch for one second.</p> <p>Recharge battery or connect to AC power.</p> <p>Connect AC cord.</p>

Symptom	Possible Cause	Corrective Action
Instrument does not meet zero count specification (<1 particle/5 min).	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 or longer before attempting zero count test.
	The filter assembly or inlet are dirty or contaminated with particles.	Clean the HEPA filter fitting or run an extended test to clean out particles.
	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.
Battery does not charge	The battery may not be installed or is disconnected.	Check battery.
Low Battery Indicator	Low battery.	Recharge battery or connect AC cord
Software doesn't connect to unit	No connection or power.	Check that USB is connected to instrument and instrument is turned on.
	Unit is running a sample or in a sub menu.	Stop sample and make sure screen shows main view.

## CHAPTER 7

# Contacting Customer Service

This chapter gives directions for contacting people at TSI Incorporated for technical information and directions for returning the AeroTrak® Handheld Airborne Particle Counter for service.

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## Technical Contacts

- If you have any difficulty setting up or operating the AeroTrak Model 9303, 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](mailto:technical.service@tsi.com).
- If the AeroTrak Model 9303 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

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**Web:** [www.tsiinc.fr](http://www.tsiinc.fr)

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## Returning the AeroTrak Handheld 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.

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# APPENDIX A

## Specifications

All specifications meet or exceed JIS B9921. They are subject to change without notice.

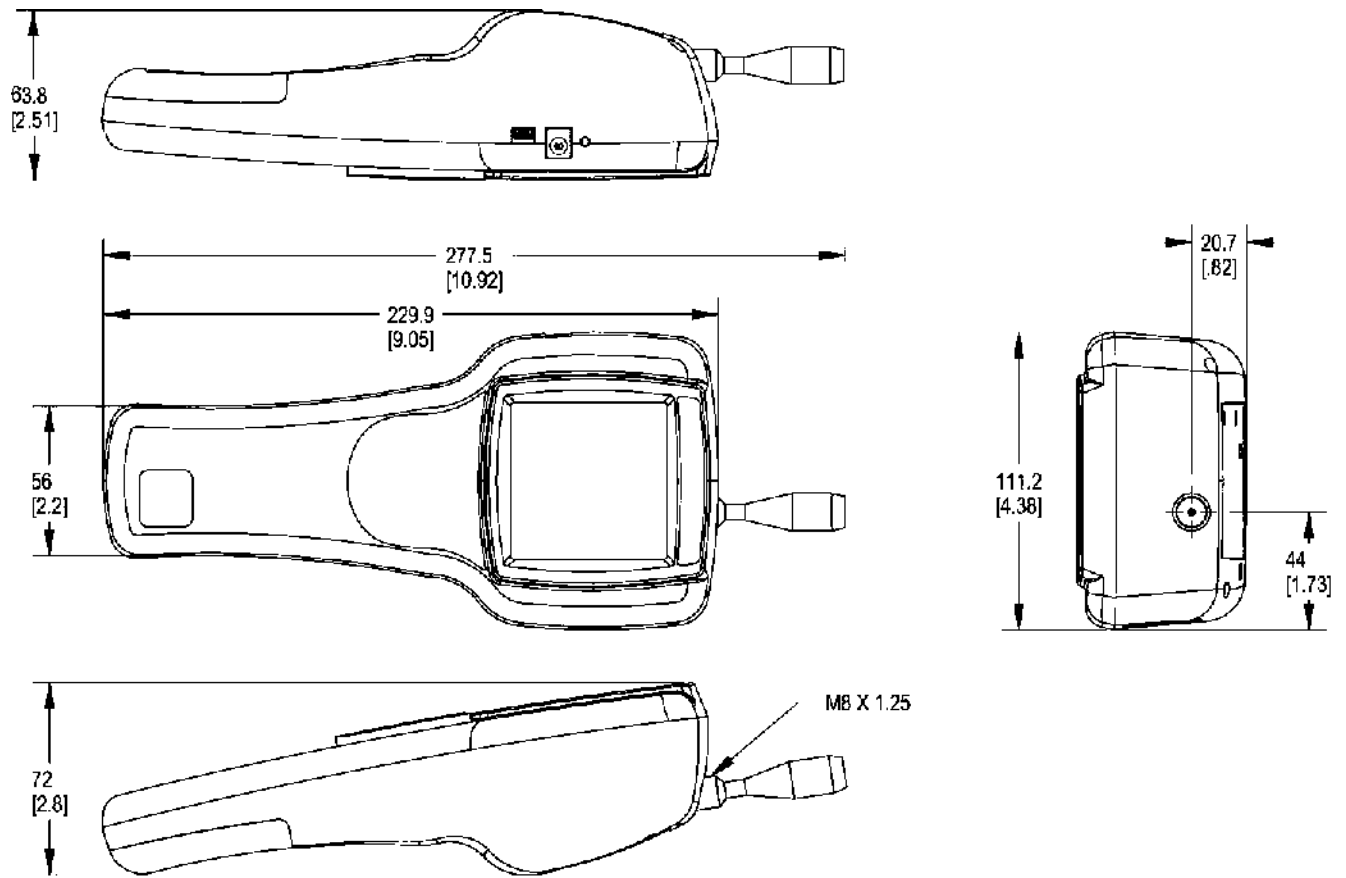
Size Range	0.3 to 25 µm
Channel Sizes	0.3 µm and 5.0 µm fixed; 0.5, 1.0, 2.0, or 2.5 µm selectable middle channel.
Counting Efficiency	50% at 0.3 µm; 100% for particles > 0.45 µm (per ISO 21501-4 and JIS)
Concentration Limits	2,000,000 particles/ft <sup>3</sup> at 5% coincidence loss
Light Source	Long life laser diode
Zero Count Level	<1 count / 5 minutes (per ISO 21501-4 and JIS B9921)
Flow Rate	0.1 CFM (2.83 L/min)
Calibration	NIST traceable with TSI calibration system
Sample Probe/Tubing	Isokinetic sampling probe
Sampling Modes	Manual and automatic
Sampling Time	1 second to 99 minutes 59 seconds
Sampling Frequency	1 to 999 cycles or continuous
Exhaust	Internal HEPA filter
Vacuum Source	Internal pump
Communication Mode	USB serial output
Data Storage	1,500 sample records
Status Indicators	Low battery and service
Display	3.2-in. (8.1 cm) 160 x 160 monochrome LCD
External Surface	High impact injection molded plastic
AC Power (power to AC adapter)	110 to 240 VAC 50-60 Hz Universal in-line power supply with country specific plugs
DC Power (power to instrument)	9 VDC @ 1.5 A
Battery	Rechargeable Li-Ion
Battery Life	Up to 4.5 hours of continuous use
Recharge Time	< 3 hours
Dimensions (L x W x H)	9.1 x 6.3 x 2.4 in. (23 x 11 x 6.2 cm) (without isokinetic inlet)

Weight	1.3 lbs (0.58 kg) with battery
Standards	CE, JIS B9921, ISO 21501-4
Warranty	1 year (extended warranties available)
Operating Conditions	41° to 95°F (5° to 35°C) temperature and 20% to 95% non-condensing relative humidity
Storage Conditions	32° to 122°F (0° to 50°C) temperature and up to 98% non-condensing relative humidity
Included Accessories	Operating manual on CD, power supply, battery, isokinetic inlet, purge filter, USB cable and TrakPro™ Lite data download software
Optional Accessories	Spare battery, isokinetic probe, sample tubing and carrying case

## 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



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UNDERSTANDING, ACCELERATED

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P/N 6002277 Rev J

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Printed in U.S.A.

