AEROTRAK®
REMOTE AIRBORNE
PARTICLE COUNTER
MODELS 6310/6510/6510-VHP

OPERATION MANUAL

P/N 6007938, REVISION A
JULY 2014

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SHIP TO/MAIL TO:
TSI Incorporated
500 Cardigan Road
Shoreview, MN 5512A-3996
USA

U.S.
Technical Support:
(800) 874-2811/(651) 490-2811
Fax:
(651) 490-3824

E-mail address:
answers@tsi.com

Website:
http://www.tsi.com

INTERNATIONAL
Technical Support:
(001 651) 490-2811
Fax:
(001 651) 490-3824

Manual History

The following is a manual history of the AeroTrak® Remote Airborne Particle Counters, Models 6310/6510/6510-VHP Operation Manual (P/N 6007938).

Revision	Date
A	July 2014

Warranty

Part Number 6007938 / Revision A / July 2014

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

E-mail Address answers@tsi.com

Limitation Of Warranty And Liability (effective April 2014)

(For country-specific terms and conditions outside of the USA, please visit www.tsi.com.)

Seller warrants the goods, excluding software, sold hereunder, under normal use and service as described in the operator's manual, to be free from defects in workmanship and material for **24 months** for Models 6310/6510, and **12 months** for Model 6510-VHP, 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 and exceptions:

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. Pumps are warranted for hours of operation as set forth in product or operator's manuals;

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;

d. 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;

e. This warranty does not cover calibration requirements, and seller warrants only that the instrument or product is properly calibrated at the time of its manufacture. Instruments returned for calibration are not covered by this warranty;

f. This warranty is **VOID** if the instrument is opened by anyone other than a factory authorized service center with the one exception where requirements set forth in the manual allow an operator to replace consumables or perform recommended cleaning;

g. This warranty is **VOID** if the product has been misused, neglected, subjected to accidental or intentional damage, or is not properly installed, maintained, or cleaned according to the requirements of the manual. 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.

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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

This section gives instructions to promote safe and proper handling of the AeroTrak® Remote Airborne Particle Counters.

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

Laser Safety

The TSI AeroTrak® Remote Airborne Particle Counters (particle counter) are Class I laser-based instruments. During normal operation, you will ***not*** be exposed to laser radiation.

The following precautions should be taken to avoid exposure to hazardous radiation in the form of intense, focused, visible light. Exposure to this light may cause blindness.

- ***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
There are no user-serviceable parts inside this instrument. The instrument should only be opened by TSI or a TSI approved service technician.

WARNING
If the Particle Counter is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

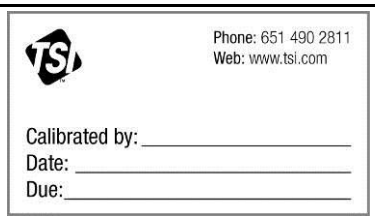
WARNING

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

When operated according to the manufacturer's instruction, this device is a Class I laser product as defined by U.S. Department of Health and Human Services standards under the Radiation Control for Health and Safety Act of 1968. A certification and identification label like the one shown below is affixed to each instrument.

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 (left-side panel)	
2. Calibration label (right-side panel)	
3. Laser radiation label (internal)	**DANGER!** VISIBLE LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO BEAM WARNING: NO USER SERVICABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL
4. Laser radiation symbol label (internal)	
5. European symbol for non-disposable item. Item must be recycled.	

Description of Caution/Warning Symbols

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

Caution

C a u t i o n
Caution means ***be careful***. Not following the procedures prescribed in this manual may result in irreparable equipment damage. Caution also indicates important information about the operation and maintenance of this instrument is included.

Warning

W A R N I N G
Warning means unsafe use of the instrument could result in serious injury or cause irrevocable damage to the instrument. Follow the procedures prescribed in this manual to use the instrument safely.

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.

Reusing and Recycling

	As part of TSI Incorporated's effort to have a minimal negative impact on the communities in which its products are manufactured and used: - Do ***not*** dispose of used batteries in the trash. - Follow local environmental requirements for battery recycling. - If instrument becomes obsolete, return to TSI for disassembly and recycling.

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
Web site: www.tsi.com

CHAPTER 1

Introduction and Unpacking

The AeroTrak® Remote Airborne Particle Counter (particle counter) with Pump is a compact sensor that is appropriate for use in multiple locations in a large clean room or critical environment to continuously monitor a process. The sensors are very simple compared to a typical particle counter. They have no display (other than several LED indicators) but have an internal blower that is controlled to provide a constant volumetric flow rate of 1 cfm (28.3 L/min).

Sensor data and particle counter information is communicated to an external device via integrated Ethernet (TCP/IP), serial Modbus RTU communications and 4-20 mA outputs and a digital contact. Oftentimes, this data is sent to a data logging software, like TSI's Facility Monitoring Software.

The following table shows the remote particle counter models covered by this manual.

Model	Size Range (µm)	Flow Rate	No. Size Channels*	Size Channels (µm)
6310	0.3 to 1	28.3 L/min (1 cfm)	4	0.3/0.5/0.7/1 µm*
6510	0.3 to 5	28.3 L/min (1 cfm)	4	0.5/0.7/1/5 µm*
6510-VHP	0.3 to 5	28.3 L/min (1 cfm)	4	0.5/0.7/1/5 µm*

*While these Remote Particle Counters have four size channels, only two analog outputs are available to use at any one time.

Unpacking the AeroTrak Remote Airborne Particle Counter

Carefully unpack the AeroTrak Remote Airborne Particle Counter (particle counter) from the shipping container and check the contents of the shipment against the tables below. If any parts are missing or broken, notify TSI immediately. Keep the shipping container for returning the device for service.

Qty.	Item Description	Part/Model	Reference Picture
1	AeroTrak Remote Airborne Particle Counter with Pump	6310 6510 6510-VHP	
1	Isokinetic Inlet	700250 (inlet) 700252 (cap)	
1	Tube Inlet	700251	
1	3 meters of tubing 3/8” ID tubing		
1	Operation Manual (6007938) installed on CD		
1	Calibration Certificate		

Qty.	Item Description	Part/Model	Reference Picture
1	Certificate of VHP Resistance (for 6510-VHP only)		

Optional Accessories

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

All Models

Item Description	Part/Model	Ref.
HEPA Zero Filter Assembly	7000119	
Power Supply	700253	
Enclosure for AeroTrak Remote with Pump	700246	Enclosure only
Sample Tubing Superthane Tubing – ¼ ID ⅜ OD 100 ft Superthane Tubing – ¼ ID ⅜ OD 1000 ft	 700011 700012	

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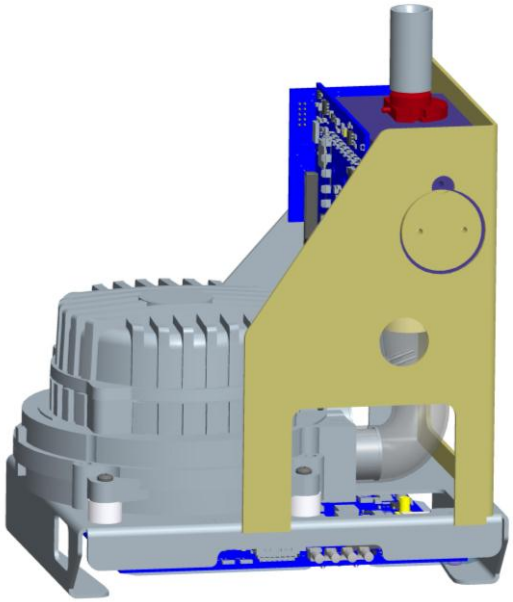
CHAPTER 2

Installation and Getting Started

This chapter describes the features, connections, and installation of the AeroTrak® Remote Airborne Particle Counter (particle counter).

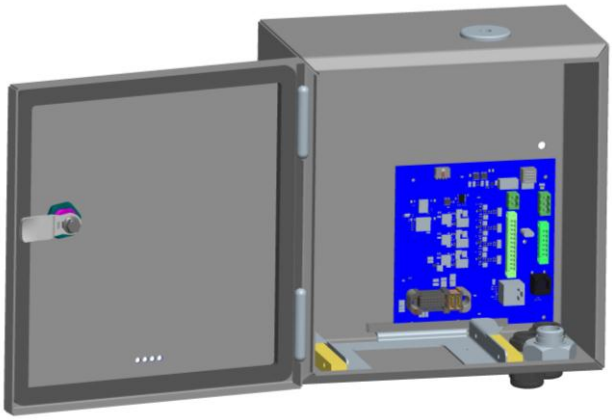
Sensor Assembly

The sensor assembly and the enclosure come as separate packages. Open the shipping container containing the sensor assembly. The sensor assembly is identified by its serial number which is the same as the serial number on the enclosure. No further assembly is required for the sensor assembly. The sensor assembly comes with the blower, the main board, the optics block, the laser board and the detector board.



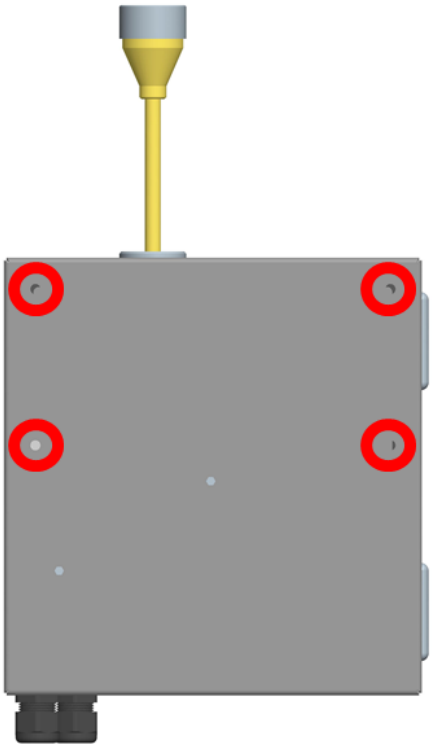
Enclosure Assembly

The enclosure assembly comes with the enclosure and the Interconnect board as shown.



Assembling the Sensor and the Enclosure

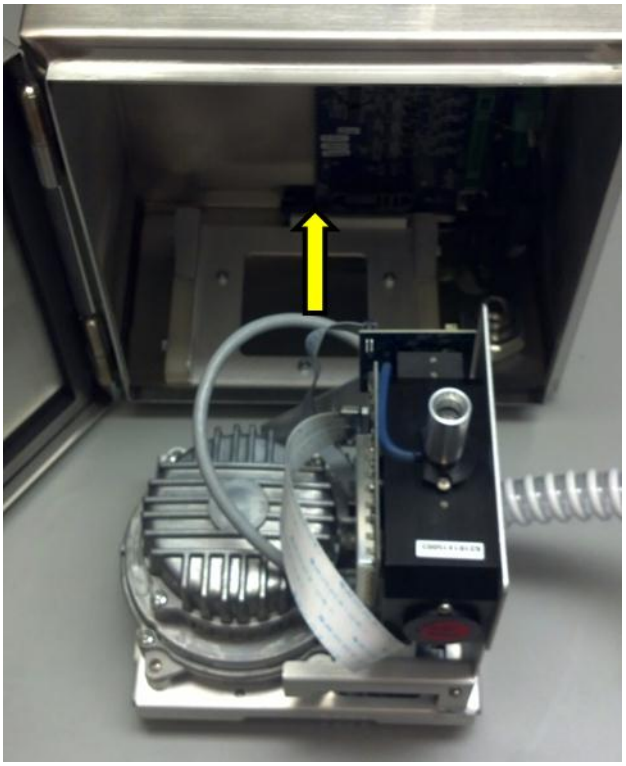
After an appropriate location is selected to install the AeroTrak Remote with Pump, attach the enclosure to the wall or a bracket using the mounting holes as shown.



Installing the Sensor in the Enclosure

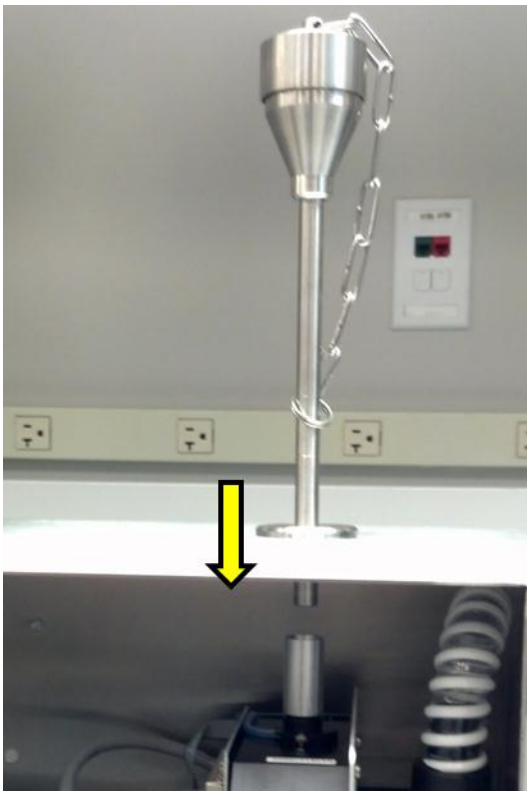
To install the sensor in to the enclosure, follow the procedure illustrated below:

1. Install the sensor using the guiding rails in the enclosure as shown below. Make sure the sensor snaps in to the enclosure.



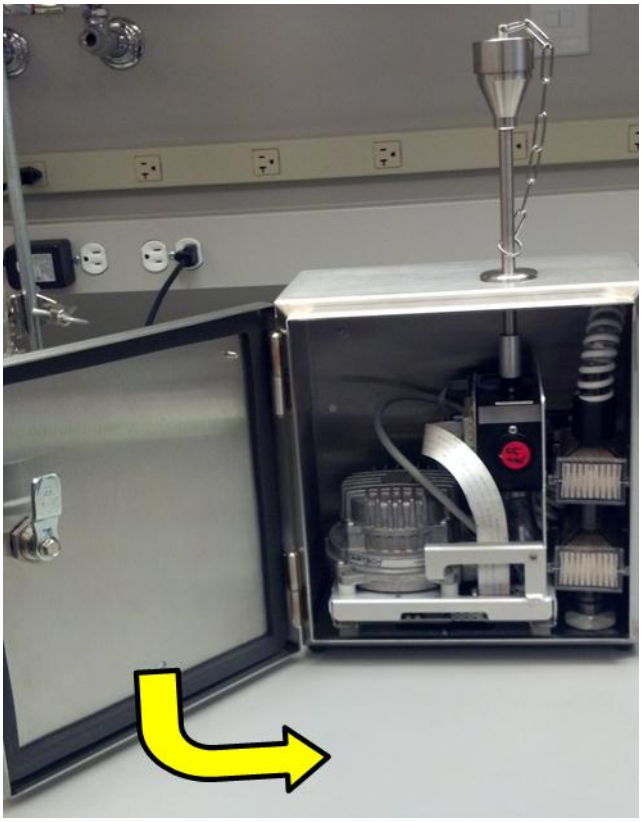
2. Install the exhaust filters as shown below.

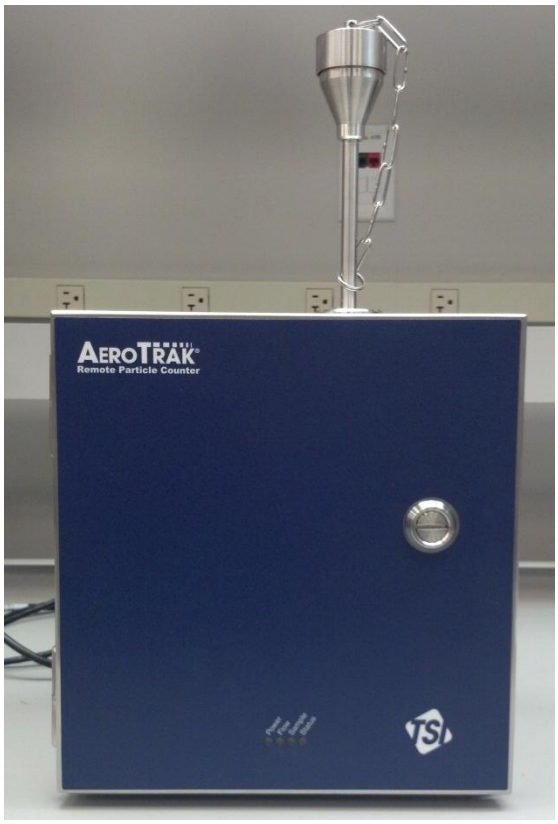
3. Install the inlet as shown.



4. Push the inlet until it bottoms out as shown.

5. Close the enclosure door as shown below.





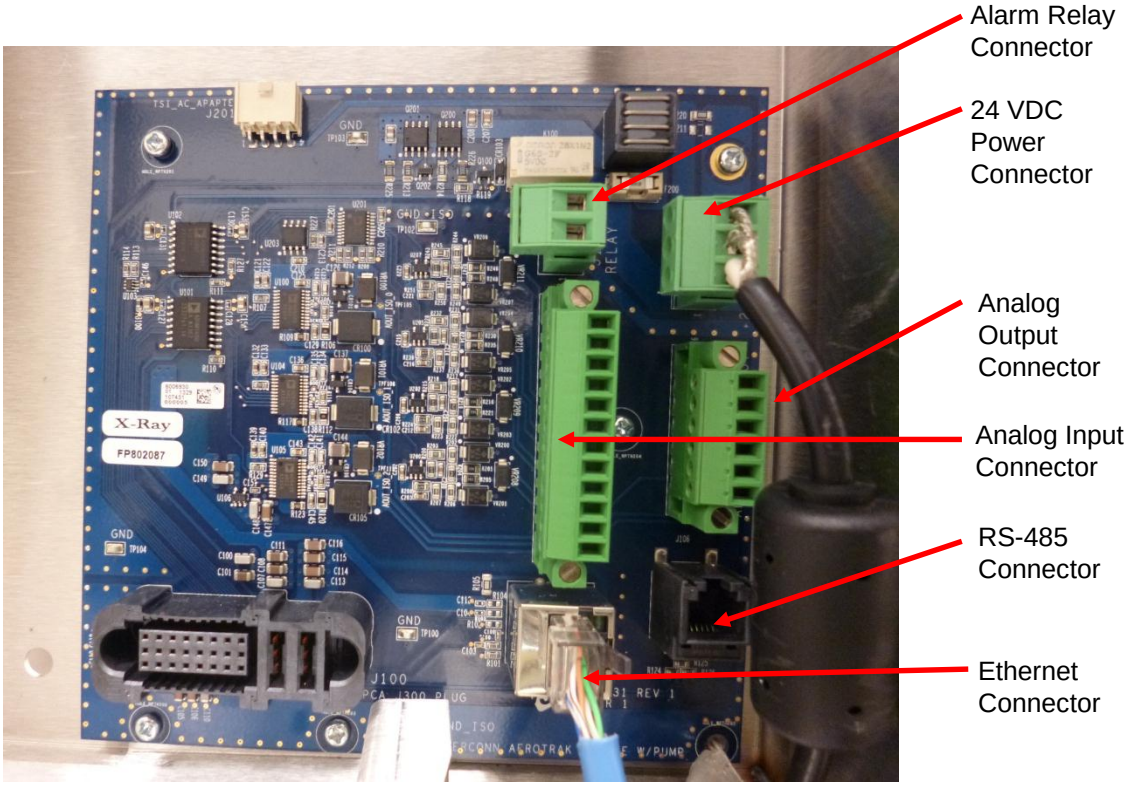
Indicator LEDs

The four LEDs on the front of the Remote Airborne Particle Counter provide indication of the particle counter's operation as described in the table below.

Indicator	Status	Function
Power/Service	Off	Device is not powered
	Green	Power is present and device is functioning normally
Flow	Yellow	Flow is normal
	Flashing Yellow	Flow error or flow blocked
Sample	Blue	Counting is enabled
	Off	Counting is disabled
Status	Green	Device is functioning normally
	Red	Device has a laser, flow or detector error requiring service

Electrical Connections

The state-of-the art AeroTrak Remote Airborne Particle Counter (particle counter) supports multiple communications and connectivity options. All connectors are available on the Interconnect Board that never needs to be disassembled. The Interconnect Board along with all the connectors are detailed below:



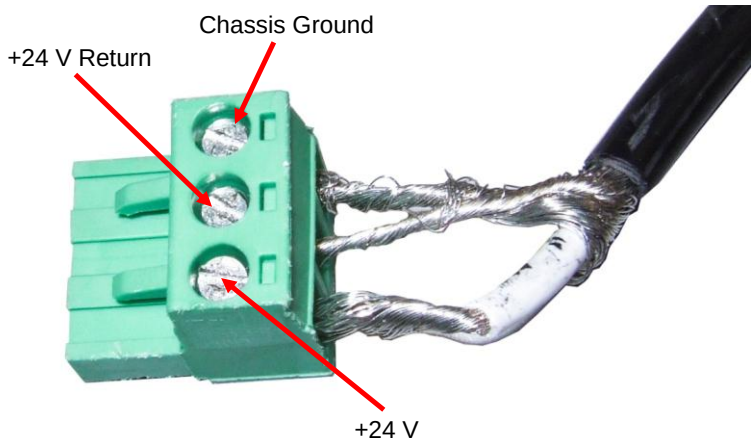
Device Connections

- 24 VDC connector
- Ethernet connector
- Alarm, Temp/RH connector
- Analog Input connector
- RS-232/485 connector

24 VDC Connector

This power connection is for use with an external supply. AeroTrak Remote will need an external power supply to power the electronics and the blower. Current draw is 3A when blower is fully blocked and 1.1A under normal operating conditions. Hence, a power supply of 24VDC @ 3A should be more than adequate. Total power consumption under normal operating conditions is about 30W.

Terminal	Direction
1	+24V
2	+24V Return
3	Chassis Ground



Ethernet Connector

The particle counter is compatible with either 10 or 100 MBps systems and connectivity is established using a CAT 5e cable. The green LED indicates that the network is connected. The yellow LED indicates activity on the network cable. The counter cannot be operated using power-over-Ethernet (POE).

The Ethernet LAN connector is a standard 10/100 Mbps CAT 5e cable.

Analog Input Connector

This 12 pin connector is used for the 4 channel 4-20 mA inputs. The unit is capable of supplying 24V @ 100mA that can be used to power the 4-20 mA sensors used for monitoring.

Terminal	Channel	Direction
1	1	Input
2	1	Return
3	2	Input
4	2	Return
5	3	Input
6	3	Return
7	4	Input
8	4	Return
9	+24V	Output
10	+24V	Output
11	+24V Return	Return
12	+24V Return	Return

Analog Output Connector

This 6 pin connector is used for the 3 channel 4-20 mA outputs. 2 of the analog outputs are configurable, via the web page, to linear / log scale and linked to a particle channel.

Terminal	Channel	Direction
1	A	Output
2	A	Return
3	B	Output
4	B	Return
5	Status	Output
6	Status	Return

The last analog output is dedicated to status information. The output will go to a nominal current value that corresponds to the condition listed below.

Current	Flow Status	Laser Status
8 mA	OK	OK
12 mA	OK	Alarm
16 mA	Alarm	OK
20 mA	Alarm	Alarm

Relay Connector

The alarm contact is used to indicate an alarm condition. The alarm contact closure is normally open. The contact closes upon an alarm, which could be a high particle alarm, a laser error, a detector error, or a flow error, depending on the configuration of the particle counter. The relay contact is rated for a 2A @ 30 VDC or 0.5A @ 125 VAC load. This relay is not controlled by external software i.e. FMS and is configured on the web page

RS-485 Connector

This connector supports RS-485 Serial communication. It can be used with TSI-provided cables to communicate with legacy controllers that do not support Ethernet.

Tubing Connections

Inlet

The sampling inlet at the top of the device can be configured with a straight inlet (default) for sampling or connection to a sample tube. This inlet can also be replaced with an isokinetic sampling inlet configured based on the sample flow of 28.3 L/min. See the table of optional accessories in Chapter 1 for more information.

Installation

Installation of the AeroTrak Remote Airborne Particle Counter (particle counter) consists of:

- Determining the installation location
- Mounting the particle counter
- Supplying power to the particle counter
- Connecting communications from the particle counter to the computer
- Connecting the vacuum and sample tubes to the particle counter

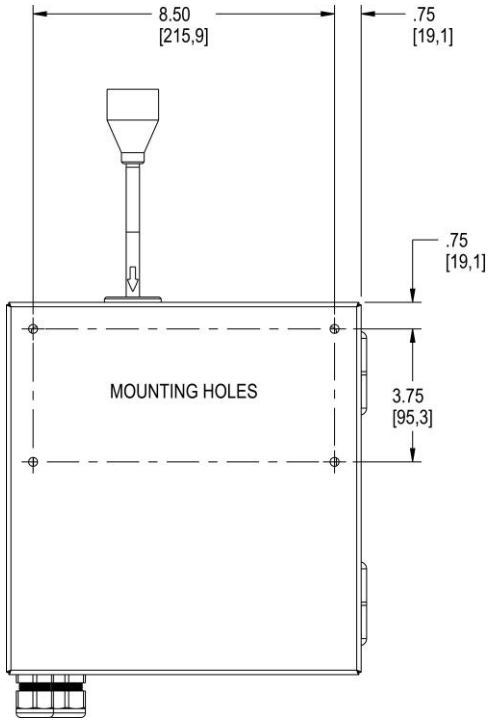
Determine the Installation Location

Determine the installation location according to your monitoring needs. The Remote Airborne Particle Counter should be mounted such that the sensor assembly can be easily installed and removed for calibration. It is generally convenient to mount the particle counter to a vertical flat surface such as a wall, but the particle counter can also be mounted on or under a table, on the ceiling, inside a vented hood, or a location close to the point of measurement. When mounting to a table, make sure there is adequate clearance between the bottom of the enclosure and the surface of the table as the blower exhausts flow at the bottom of the enclosure and there are glands that project out at the bottom of the enclosure.

Mounting the Remote Airborne Particle Counter

The Remote Airborne Particle Counter can be mounted using a variety of mounting brackets and schemes.

To install the particle counter, use the mounting holes shown in the figure. See detailed dimensional drawings at the end of the manual.



Exhaust

Supplying Power to the Remote ≥ 1µm Airborne Particle Counter

The AeroTrak Remote Airborne Particle Counter must be powered by an external 24 VDC power supply or the optional TSI Model 70000x power supply (24 VDC).

WARNING

If the Remote Airborne Particle Counter is powered by an external 24 VDC power supply that is capable of providing 3 Amps. Or 72 W.

Using DC Power

To supply DC power to the particle counter:

1. Connect the 24 VDC connector to the instrument at the power entry connector as shown in the figure above.
2. Connect the appropriate power cord to the 24 VDC supply and plug it into a suitable AC outlet. The power light on the particle counter should illuminate.

Connecting the Remote Airborne Particle Counter to a Computer

There are three options for communicating with particle counter:

- Modbus TCP over Ethernet
- Ethernet Web Browser
- Modbus RTU over RS-485 Serial

For more information, please refer to Chapter 3, Communications.

Modbus® TCP over Ethernet

Modbus® TCP over Ethernet is the preferred method of communications with the particle counter. Using the eight-pin RJ-45 socket described above, Modbus® RTU provides compact, binary representation of the data contained in a register within the instrument memory.

Note: *The Remote Airborne Particle Counter with pump operates only in "half-duplex" mode. Make sure that the switch, router, or Ethernet adapter it is connected to is also configured to communicate in half-duplex mode (typically this is the default).*

Ethernet Web Browser

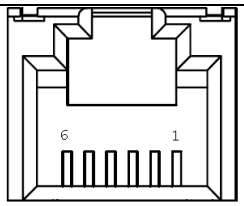
The method for using a web browser to communicate with an instrument is covered in Chapter 3, Communications.

Modbus® RTU over RS-485 Serial

The serial communications connector provides RS-485 Serial communications.

The serial connector is a standard A-Position A-Contact (6P6C, often called RJ12) modular plug connection that supports RS-485 devices.

Pin	Description
1	TX
2	RX
3	B
4	A
5	GND
6	Unused



Socket View

The communications settings for RS-485 are:

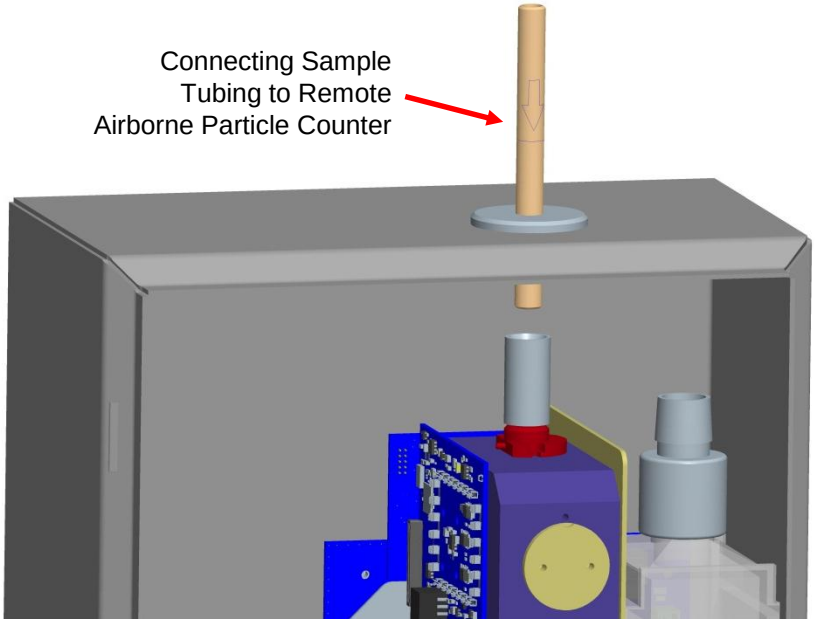
- 19200 Baud
- 8 data bits
- no parity
- 1 stop bit, no flow control.

For more information, please refer to Chapter 3, Communications.

Tubing Installation

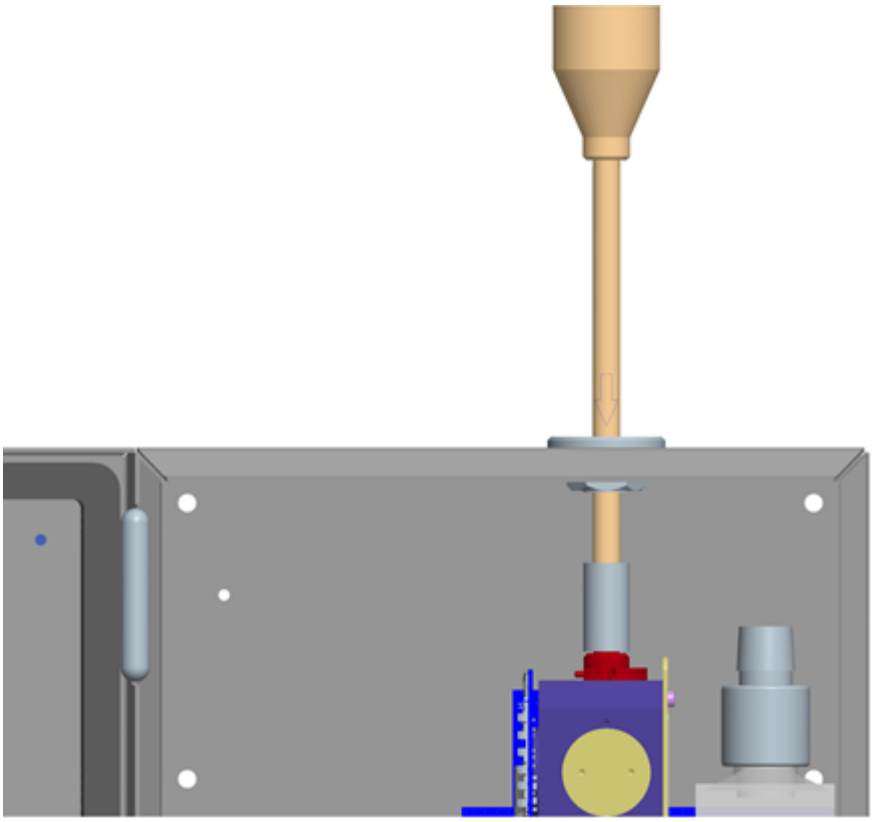
Connecting Sample Tubing

Sample tubing is used to carry a sample from a location close to a critical process to the particle counter a short distance away. This requires tubing such as specified in the optional accessories table in Chapter 1. Tubing length should be kept as short as possible (no more than 3 meters or 10 feet when measuring particles ≥ 1µm) with minimum number of bends to minimize particle loss. In addition, care should be taken not to use tubing that may carry a very high static charge (such as Teflon® tubing). This will act like a filter and prevent particles being sampled into the device.



®Teflon is a registered trademark of DuPont.

The Isokinetic probe can also be used as shown below.



CHAPTER 3

Communications

Generally the particle counter will be set up as one of many sensors in a network. In this case the operation of the network is controlled through Facility Management Software (TSI® FMS Software) running on a personal computer. FMS Software can be configured to communicate with the particle counter through either Modbus TCP over Ethernet or Modbus RTU over RS-485. Consult the FMS Software manual for more information.

***Note**: Technical documentation for integrating the TSI Airborne Particle Counter into custom applications, including details of the Modbus® implementation, is available upon request. Contact TSI Customer Service (see "Getting Help").*

Setting the IP Address of the Airborne Particle Counter

By default, each Airborne Particle Counter is shipped with an Ethernet address of 192.168.200.90. Since the IP address is fixed, before the remote Airborne Particle Counter can communicate with your computer system, you must assign an IP address to it that is compatible with your network. An example is shown below using Windows® XP operating system. Other operating systems and browsers should be similar.

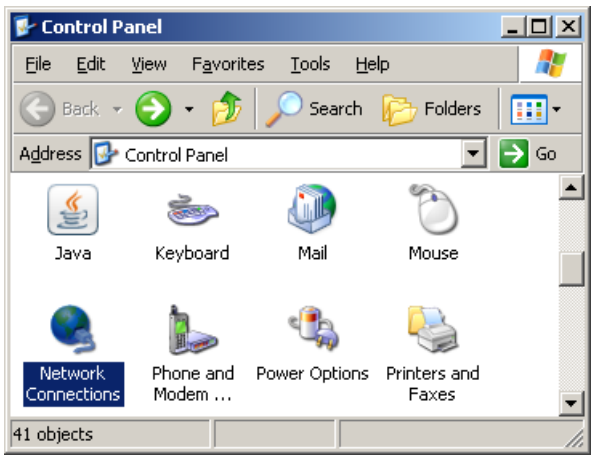
***Note:** In a typical application, Airborne Particle Counters are configured using static IP addresses so that remote hosts and software can be configured to query each specific counter at known addresses. It is also possible to configure the Airborne Particle Counter using DHCP (Dynamic Host Configuration Protocol), but this should be done with care to ensure that the IP address of each device is known and always the same for each device. Further details of TCP/IP networking are beyond the scope of this document.*

To connect to your Airborne Particle Counter with an internet browser, you will need the following:

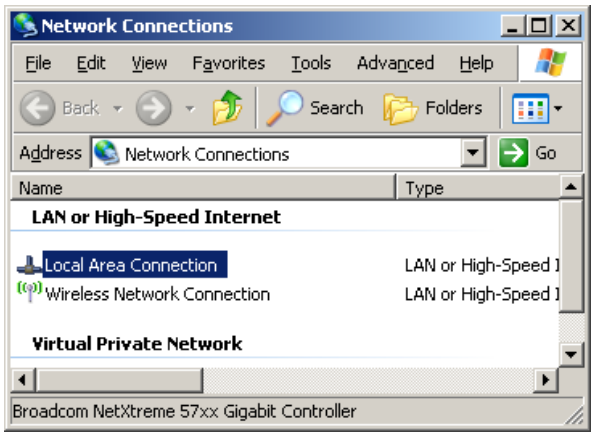
- A Computer with a 10/100 Ethernet port.
- Ethernet crossover cable or an Ethernet hub and two standard cables.
- Airborne Particle Counter to be configured.
- A fixed IP address for your network.

You will connect the Airborne Particle Counter to your computer on a “mini-network” consisting of just the computer, Airborne Particle Counter and an interface cable or hub. Follow the steps below to configure the IP address of your Airborne Particle Counter.

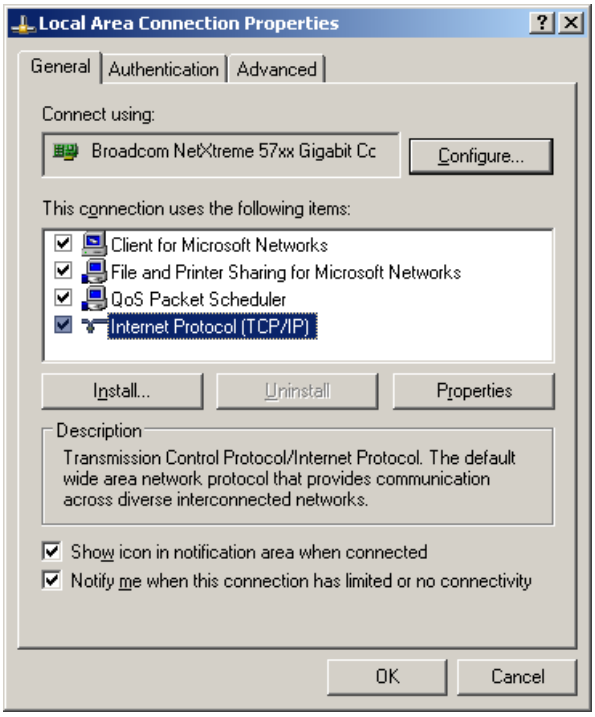
1. Physically disconnect any existing Ethernet cable from the computer to make it independent of any network. Open the Windows® control panel and click on the **Network Connections** icon.



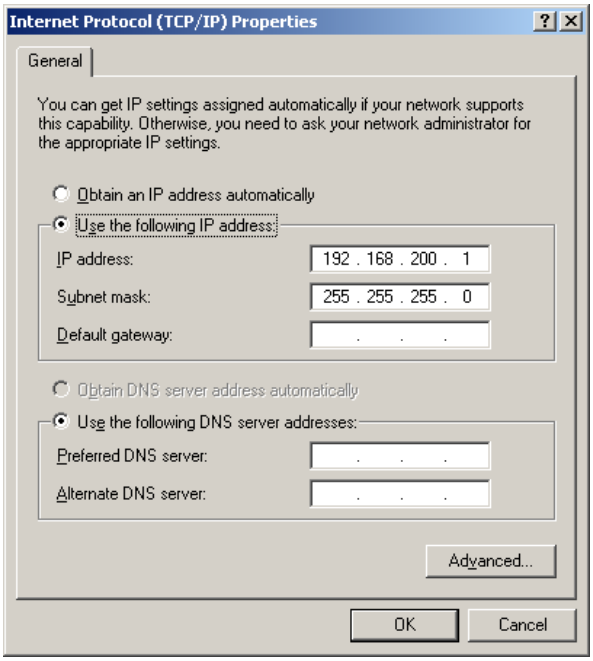
2. Click on the **Local Area Connection** icon in the list of connections.



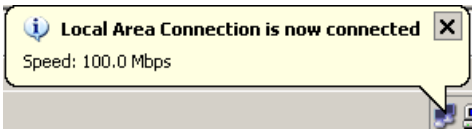
3. Double-click on the **Internet Protocol (TCP/IP)** item.



4. Set the IP Address to a fixed address as shown below and click **OK** and **OK** again.



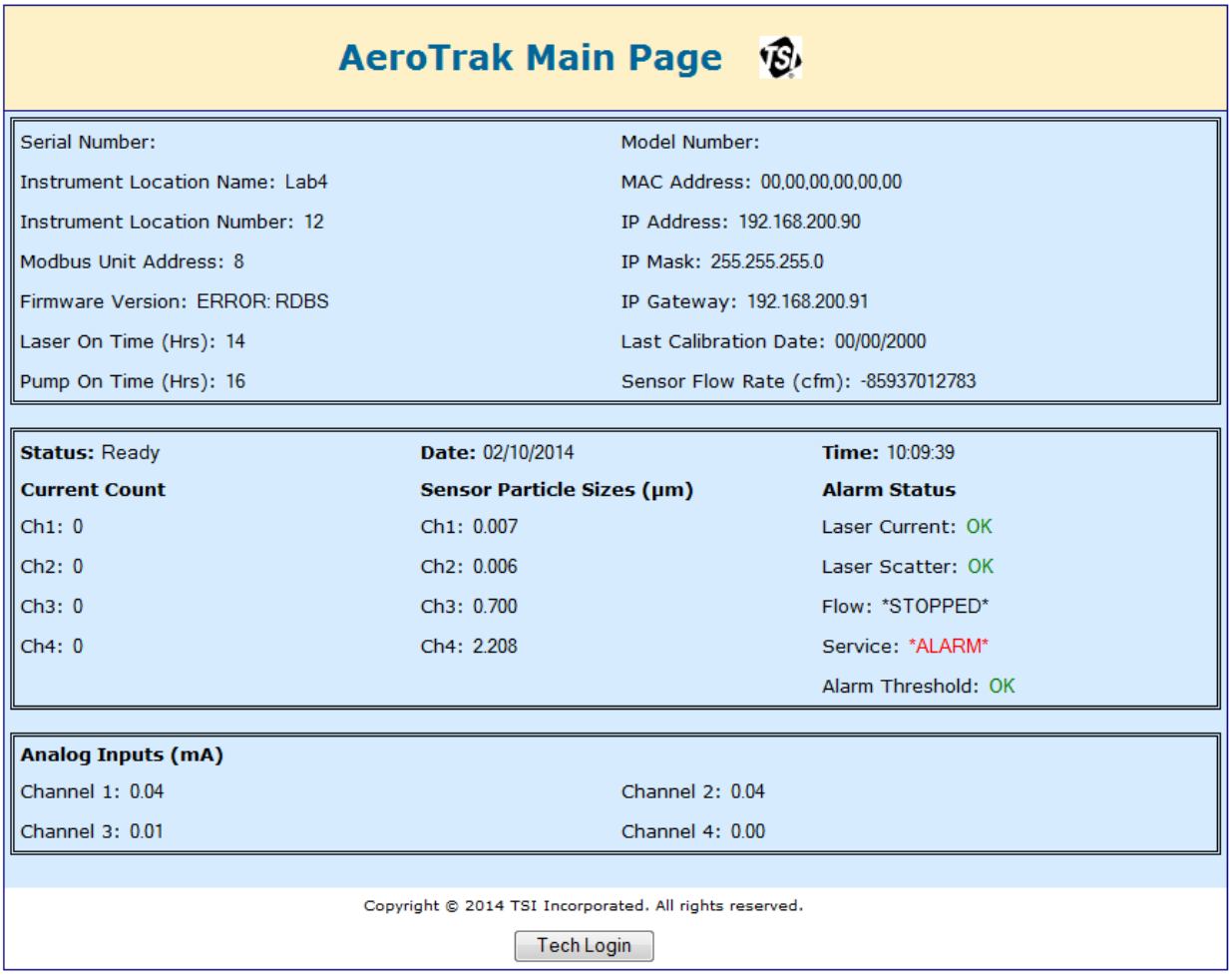
5. Plug in the Ethernet crossover cable between the computer and the Airborne Particle Counter ***or*** plug in the two standard cables and Ethernet hub between the computer and Airborne Particle Counter. A message like the one shown should appear.



6. Launch your web browser application.

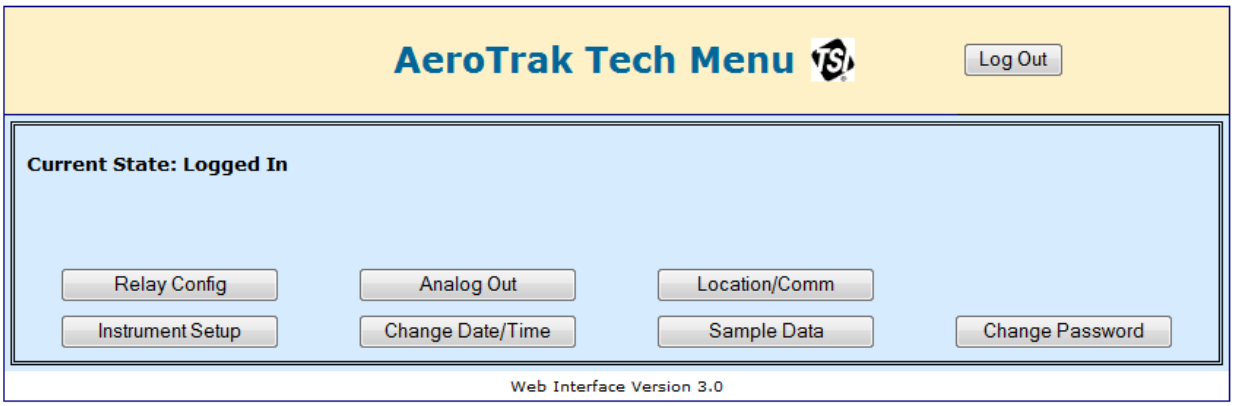
7. Enter the following URL: http://192.168.200.90 in the address bar and hit the **Enter** key.

   The following main page should be displayed.

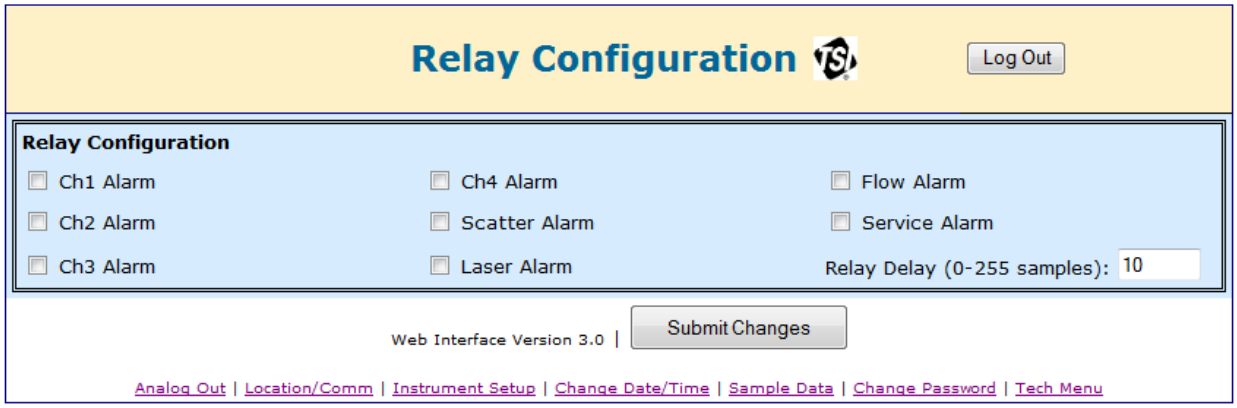


8. Click on Tech Login to setup the instrument or review logged data. For the Tech Password, enter "**admin**" (must be all lower-case) and click the **Log In** button. The technician screen should display as shown below.

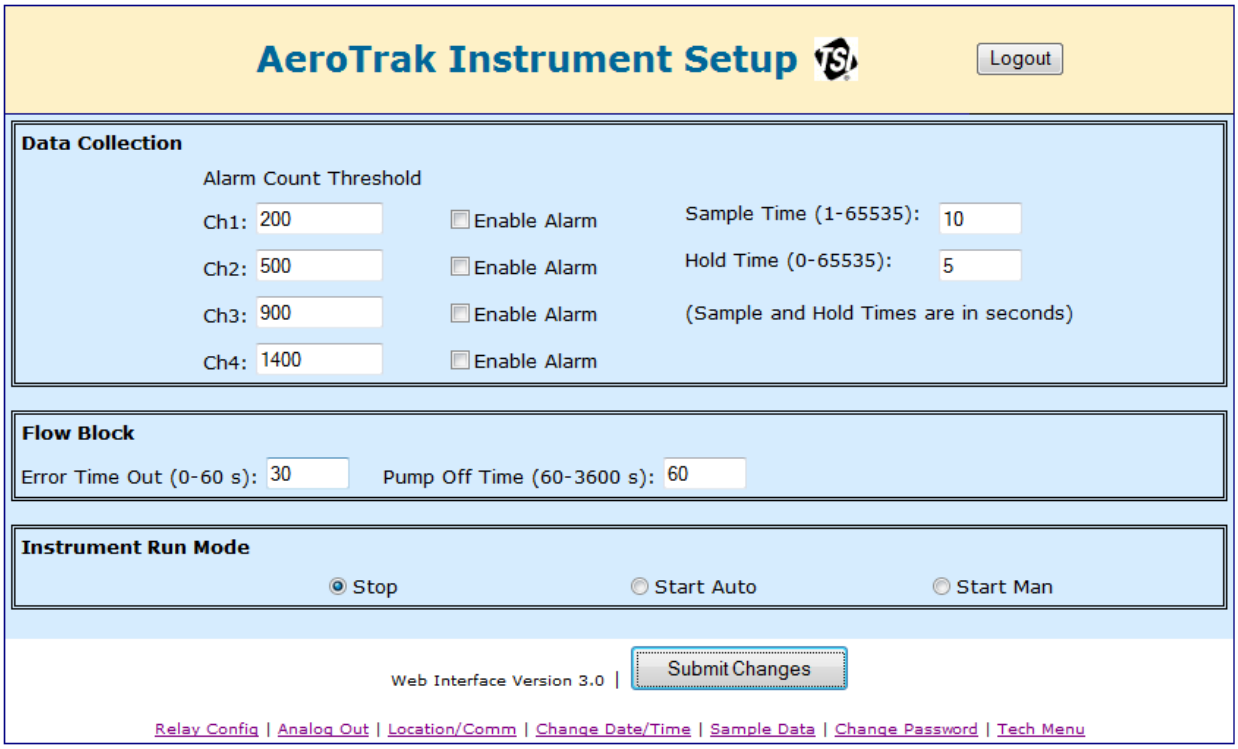
9. After Tech login, the following menu displays all the possible options required to setup the instrument.



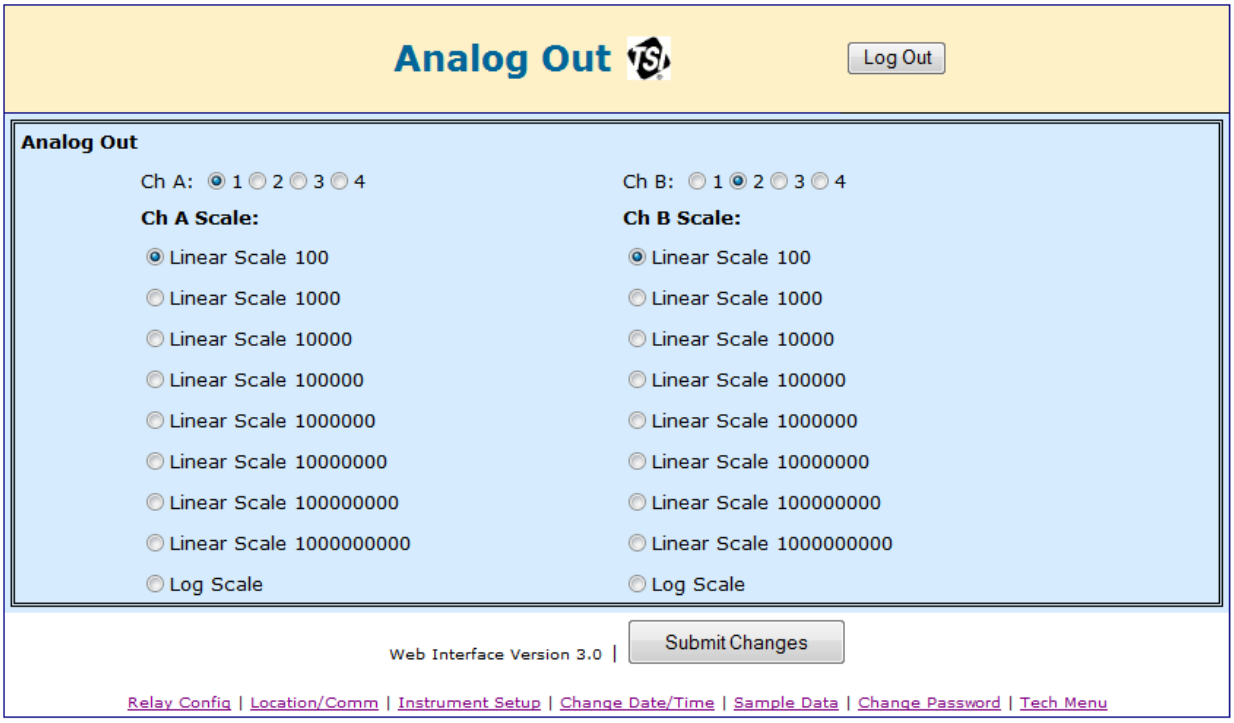
10. To setup the Relay Configuration, click on **Relay Config** to enter the Relay Configuration screen as shown below.



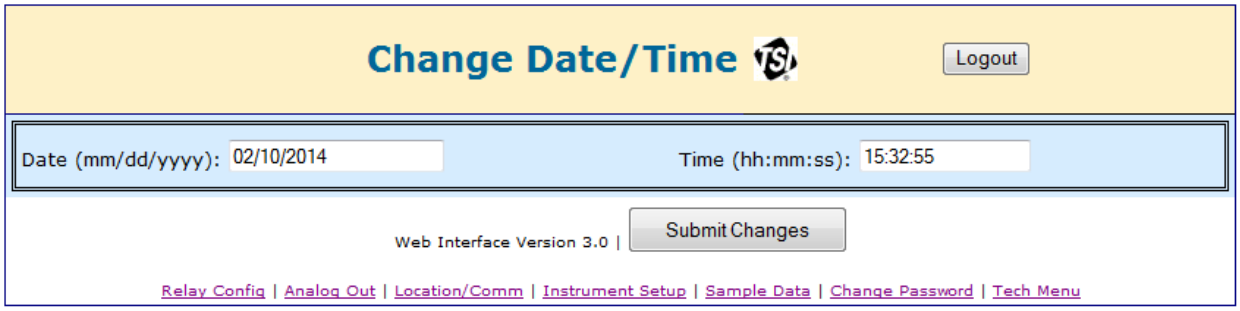
11. To setup the instrument, click on the **Instrument Setup** link at the bottom of the screen. The Setup screen is shown below.



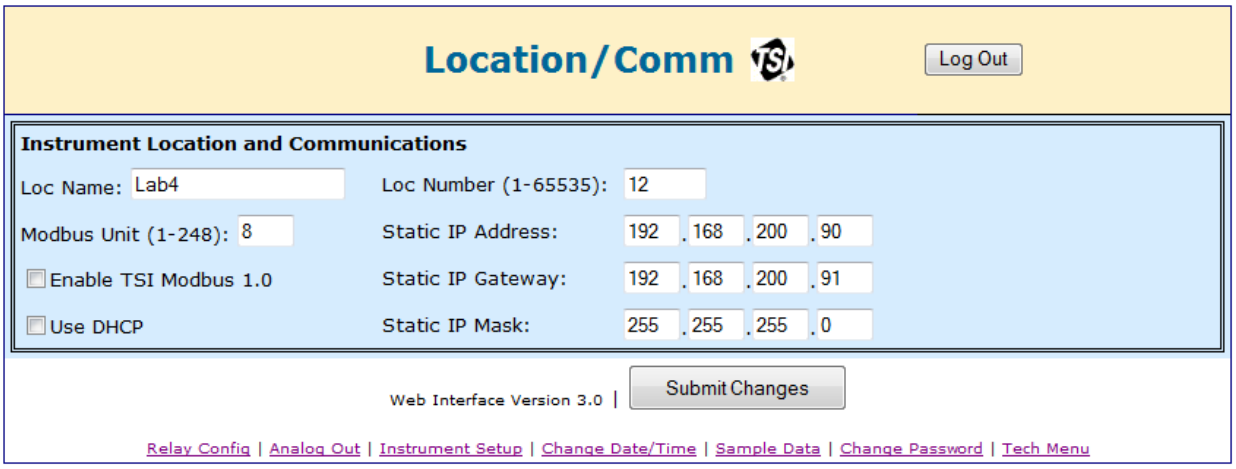
12. To configure the Analog O/P, click on the **Analog Out** link at the bottom of the page and you will be taken to the Analog Output screen as shown below.



13. To Change the instrument's time and date, click on the **Change Date/time** link to set up the time and date as shown below.



14. To setup the Location and the Communications, click on the **Location/Comm** link at the bottom of the page. The instrument may be setup as shown below.

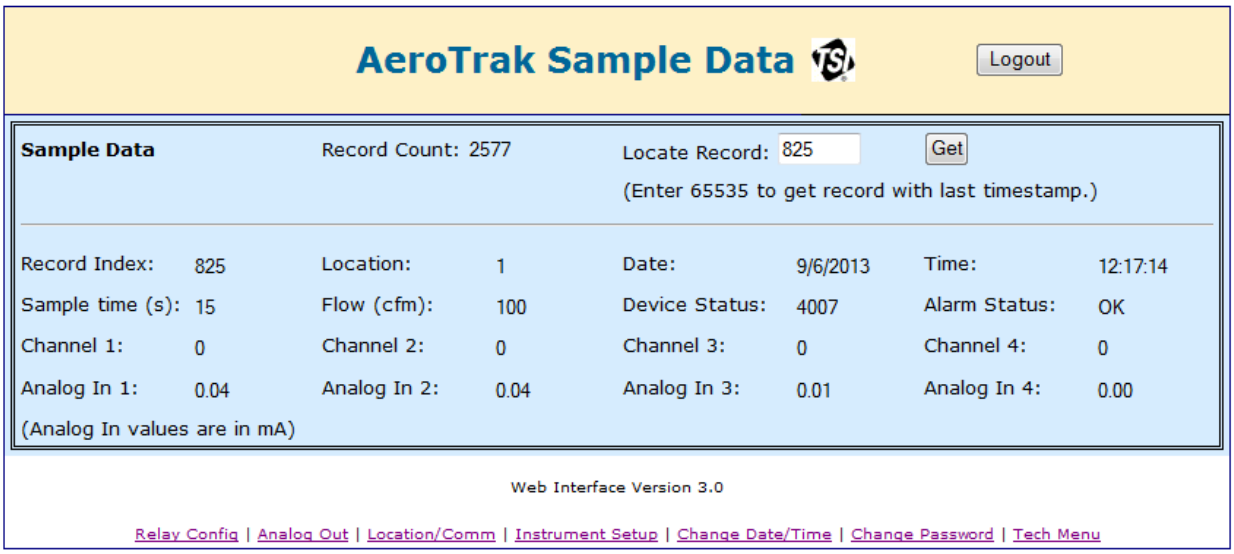


15. Typically Airborne Particle Counters will be configured with a static IP address and the **Use DHCP** checkbox will be unchecked. To enable DHCP, check the **Use DHCP** checkbox. In this case, the other settings are unused.

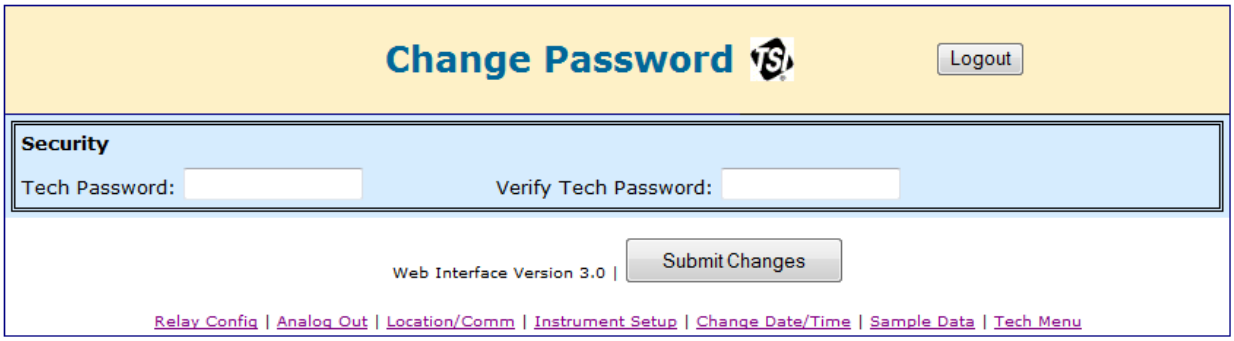
16. For static IP addressing (typical configuration) enter values for the **Static IP Address**, **Static IP Mask** (subnet mask), and **Static IP Gateway** (default gateway for the subnet).

17. Press **Set Addressing** to send the values to the instrument. Note that the IP address changes do ***not*** take effect until the instrument power is turned off and on again. Be sure to carefully record the values entered. It is impossible to communicate with the instrument via Ethernet when the IP address is not known.

18. To review sample data, click on the **Sample Data** link.



19. To change the Tech Password, click on the **Change Password** link.



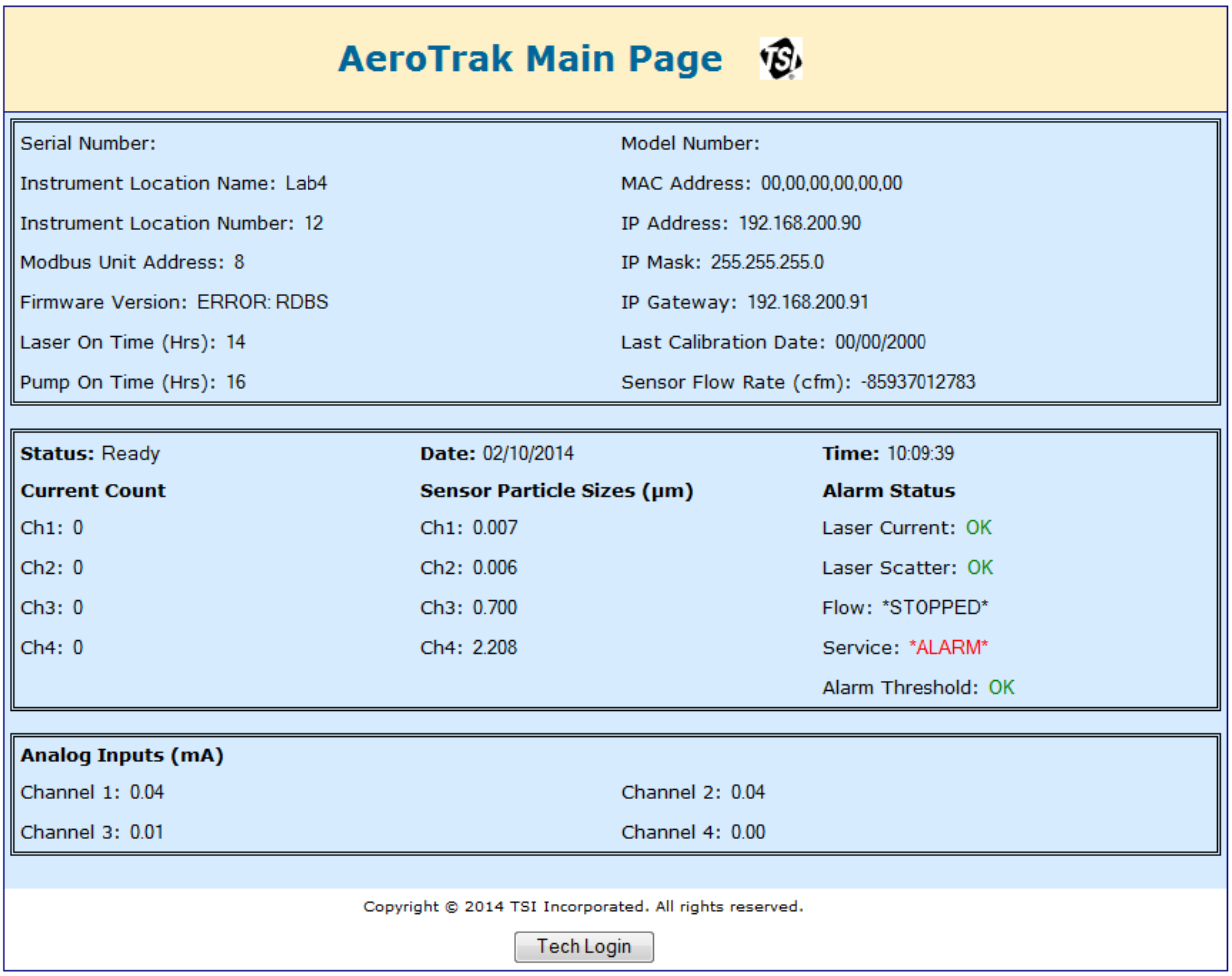
20. Press **Logout** to return to the login screen and then close your browser.
21. Disconnect the Airborne Particle Counter from the crossover cable or hub and remove DC power if it is used.
22. Reconnect the Airborne Particle Counter to your monitoring network and repeat steps 6 and 7 for the network address recorded in step 10 to confirm the new network IP address.

Configuring the Airborne Particle Counter

In addition to global settings such as IP address, time, date, and location, there are configuration settings that control sampling characteristics. Although these are typically set by FMS Software, they can also be set using the web interface.

To further configure the Airborne Particle Counter, follow the instructions above to set the IP Address first.

1. Open a web browser and enter the IP address that you configured in the steps above. A screen similar to the one below should appear. This screen provides important status and configuration information for the Airborne Particle Counter.



AeroTrak Main Page

Serial Number:	Model Number:
Instrument Location Name: Lab4	MAC Address: 00,00,00,00,00,00
Instrument Location Number: 12	IP Address: 192.168.200.90
Modbus Unit Address: 8	IP Mask: 255.255.255.0
Firmware Version: ERROR: RDBS	IP Gateway: 192.168.200.91
Laser On Time (Hrs): 14	Last Calibration Date: 00/00/2000
Pump On Time (Hrs): 16	Sensor Flow Rate (cfm): -85937012783

Status: Ready	**Date:** 02/10/2014	**Time:** 10:09:39
Current Count	**Sensor Particle Sizes (µm)**	**Alarm Status**
Ch1: 0	Ch1: 0.007	Laser Current: OK
Ch2: 0	Ch2: 0.006	Laser Scatter: OK
Ch3: 0	Ch3: 0.700	Flow: *STOPPED*
Ch4: 0	Ch4: 2.208	Service: *ALARM*
		Alarm Threshold: OK

Analog Inputs (mA)	
Channel 1: 0.04	Channel 2: 0.04
Channel 3: 0.01	Channel 4: 0.00

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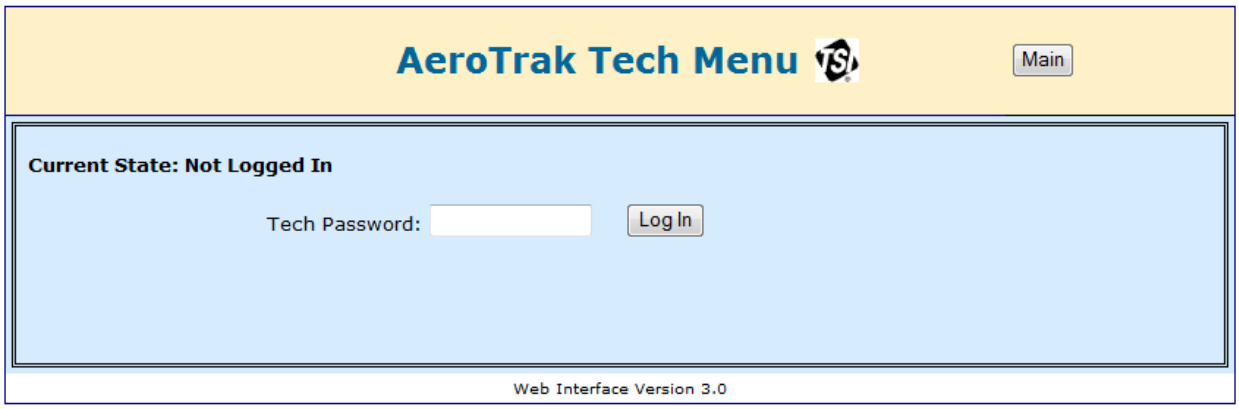
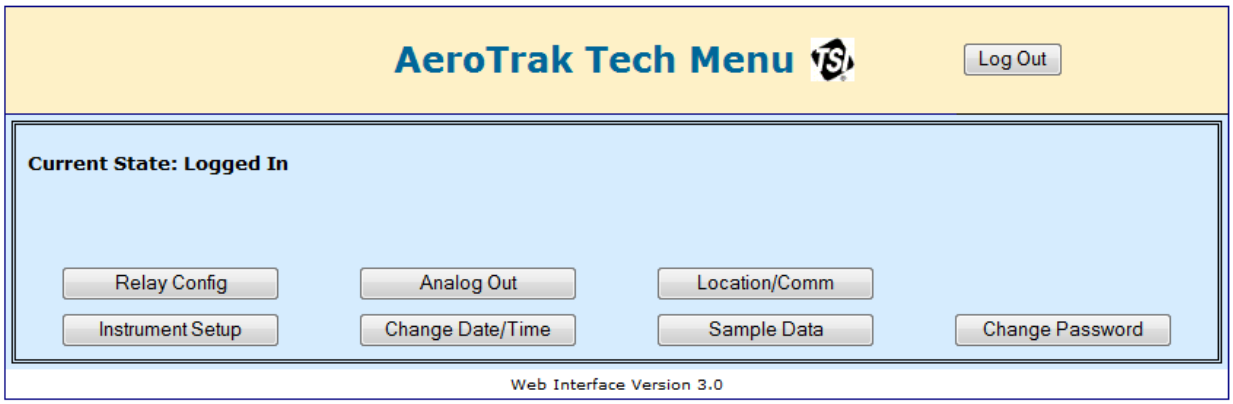
Tech Login

2. To change configuration, click on the link at the bottom of the screen marked **Tech Login**. A Login screen should appear.



3. For the Tech Password, enter **admin** (must be all lower-case) and click the **Log In** button. The technician screen should display as shown below.



4. Click on any of the screen's buttons to configure the instrument as desired.

Label	Function	Notes
Tech Password	Changes the password for access to this Tech page from its default to a password of your choosing.	**WARNING**; once changed, this password cannot be reset! Make changes cautiously and **DO NOT** forget the new password!
Date / Time	Sets counter date and time.	
Instrument Location	Readable description	Any alpha-numeric (ASCII) label up to 20 characters.
IP Address Setup	IP configuration	See details above.
Modbus® Unit Number	Modbus® address	From 1 to 256
Sample Time	Time the counter actually counts particles	1 to 65535 seconds
Hold Time	Time between samples	1 to 65535 seconds
Alarm Count Threshold	Alarm levels for each channel and checkboxes indicating whether the alarms should be enabled or not.	

Label	Function	Notes
Relay Configuration	Settings to configure which alarm states activate the Relay Closure outputs of the device (See Device Operation Manual for relay closure connection pin-outs).	Select which alarm events will trigger a Relay Closure. “Trigger Delay” can be used to defer the relay closure until the alarm condition(s) have persisted for several sample periods. If the Trigger Delay is set to 0 (default), the relay closure will occur immediately when an alarm condition is committed into the sample buffer. If the Trigger Delay is set to 10, then the alarm condition must persist continually for 10 sample periods before the contact closure will be triggered.

RS-485 Communications

The particle counter by default supports Modbus RTU over Multi-drop RS-485 serial communications using the RS-232/485 six-pin RJ-11 socket described above. Modbus RTU is a compact, binary representation of the data contained in a register within the instrument memory. Using the Modbus register map, TSI-provided software (such as FMS) can be used to control and collect data with the instrument or custom software may be written. No accessory software is provided with the instrument for communicating via RS-485.

To connect more than one particle counter to an RS-485 network (multi-drop) requires multi-drop adapters and connectors available from TSI. The instruments may then be “daisy-chained” together. When operating the particle counters in a network, care must be taken to ensure that the last communication node is properly terminated.

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CHAPTER 4

Troubleshooting

The chapter contains suggestions for troubleshooting common issues with the AeroTrak® Remote Airborne Particle Counters.

Symptom	Possible Cause	Corrective Action
Instrument does not power up – Power/Service LED is off (should be green)	External DC power is not plugged in.	Make sure power supply is adequate.
	Inadequate voltage/current @ source. Minimum of 24 VDC @ 3A is required.	Make sure the power supply connector is properly snapped in place and the wires are securely fastened to the connector.
	Chassis (includes the optics sensor with boards, blower and the main board) is not properly connected to the interconnect board inside the chassis.	Remove the chassis and snap it back in until you cannot push it further. You may do this while there is power supplied to the enclosure.
	Bad Interconnect board.	Contact Service.
	Blower/unit is overheated.	Unit will not start if the temperature inside the unit exceeds about 55°C. Open the enclosure door to cool the unit and remove any obstruction that is causing the blower to work hard.
Service LED is **RED** indicating a flow error or laser error or light scatter error	Inlet may be plugged.	Remove the cap on the isokinetic inlet when operating the instrument.
	Blower is unable to deliver the required flow of 1 CFM.	Remove any obstructions from inlet. Make sure the inlet is properly snapped in to the sensor. An arrow mark in the sensor indicates is the inlet has bottomed out on the sensor inlet. Push the inlet all the way up to the arrow mark on the inlet.
	Bad O-ring on the inlet adapter.	Replace O-ring.
	Blower is dead.	Bad Blower. Replace blower.
	Disconnected cables.	Check to make sure all cables are securely connected including the blower power cable to the main board. Disconnected cable can also cause laser error.

Symptom	Possible Cause	Corrective Action
Service LED is **RED** indicating a flow error or laser error or light scatter error *(cont.)*	Blown fuse on the main board. Unit will not power at all even if there is power supply at specified values	Contact Service.
	Too much light scatter in the chamber.	Too much light scatter in the chamber caused by contamination in the optics chamber or excessive exposure to cleaning fluids or vaporized hydrogen peroxide. Contact Service.
	Laser is bad.	Blown laser. Contact Service to replace laser.
Counting LED is off	This is normal if counting is disabled	Use FMS software or serial commands to enable counting.
Instrument does not meet zero count specification (<1 particle/5 mins)	May require cleaning.	Clean sample tube and make sure no debris is sticking to the inside of the inlet wall.
	An internal component has become damaged due to operation outside specifications.	Contact service.
	The zero filter is not connected properly and room air is leaking into the HEPA filter assembly.	Check and make sure that the zero filter is screwed tight. Make sure the inlet is properly snapped in to the sensor. An arrow mark in the sensor indicates is the inlet has bottomed out on the sensor inlet. Push the inlet all the way up to the arrow mark on the inlet.

CHAPTER 5

Contacting Customer Service

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

Technical Contacts

- If you have any difficulty setting up or operating the AeroTrak® Remote 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® Remote 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
150 Kampong Ampat
#05-05 KA Centre
Singapore 368324

Telephone: +65 6595-6388
Fax: +65 6595-6399
E-mail: tsi-singapore@tsi.com

TSI Instrument (Beijing) Co., Ltd.
Unit 1201, Pan-Pacific Plaza
No. 12 A, Zhongguancun South Avenue
Haidian District, Beijing, 100181
CHINA

Telephone: +8A-10-8219 7688
Fax: +8A-10-8219 7699
E-mail: tsibeijing@tsi.com

TSI Instruments Ltd.
Stirling Road
Cressex Business Park
High Wycombe, Bucks
HP12 3ST
UNITED KINGDOM

Telephone: +44 (0) 149 4 459200
Fax: +44 (0) 149 4 459700
E-mail: tsiuk@tsi.com
Web: www.tsiinc.co.uk

Technical Support

TSI Instruments Singapore Pte Ltd
150 Kampong Ampat
#05-05 KA Centre
Singapore 368324

Telephone: +65 6595-6388
Fax: +65 6595-6399
E-mail: tsi-singapore@tsi.com

TSI Instrument (Beijing) Co., Ltd.
Unit 1201, Pan-Pacific Plaza
No. 12 A, Zhongguancun South Avenue
Haidian District, Beijing, 100181
CHINA

Telephone: +8A-10-8219 7688
Fax: +8A-10-8219 7699
E-mail: tsibeijing@tsi.com

TSI GmbH
Neuköllner Strasse 4
52068 Aachen
GERMANY

Telephone: +49 241-52303-0
Fax: +49 241-52303-49
E-mail: tsigmbh@tsi.com
Web: www.tsiinc.de

TSI Instruments Ltd.
Stirling Road
Cressex Business Park
High Wycombe, Bucks
HP12 3ST
UNITED KINGDOM

Telephone: +44 (0) 149 4 459200
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, remove the cyclone, cap or seal the inlet orifice, and cover all connector ports to prevent debris from entering the instrument. Package instrument for shipment ensuring the front display and the inlet orifice inlet are protected.

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APPENDIX A

Specifications

All specifications are subject to change without notice.

Specification	Description
Size Range	6310: 0.3 to 25 µm 6510 & 6510-VHP: 0.5 to 25 µm
Channel Sizes	6310: 0.3, 0.5, 0.7, 1.0 µm 6510 & 6510-VHP: 0.5, 0.7, 1.0, 5.0 µm
Counting Efficiency (per JIS)	6310: 50% at 0.3 µm; 100% for particles >0.45 µm (per ISO 21501-4 and JIS) 6510 & 6510-VHP: 50% at 0.5 µm; 100% for particles >0.75 µm (per ISO 21501-4 and JIS)
Concentration Limits	821,000 particles/ft^3 (29,000,000/m^3) @ 10% coincidence loss
Size Resolution	< 15% @ 0.5µm (per ISO 21501-4)
Light Source	Long Life Laser diode
Zero Count Level	<1 count / 5 minutes (<2 particles/ft^3) per ISO 21501-4 and JIS B9921
Flow Rate	6310, 6510, 6510-VHP: 1.0 CFM (28.3 L/min) with ±5% accuracy
Calibration	NIST traceable
Sample Time	1 second to 24 hours
Vacuum Source	Blower,* -non particle generator, auto stops if flow blockage detected due inlet capping – HEPA filtered exhaust
Communication Mode	Ethernet (TCP/IP) and serial Modbus output 4-20 mA Analog Outputs: 2 channel log/linear particle counts, one channel unit status
Data Storage	3,000 sample record buffer in the event of network failure
Status Indicators	Four LEDs: Power, flow, status and sampling
External Alarm Output	Normal open dry contact rated 0 to 60 V AC/DC, 0.5 Amp continuous, 1.5 Amp peak.
Monitoring Software	FMS 5 Facility Monitoring Software, enables 21 CFR Part 11 Compliance
Sensor Configuration	Via Ethernet (TCP/IP) Web interface
Dimensions (H x W x D)	10.5 in. x 10 in. x 6.1 in. (26.7 cm x 25.4 cm x 15.5 cm)
Weight	14.3 lb (6.5 kg)
Power	24 VDC, 3 A

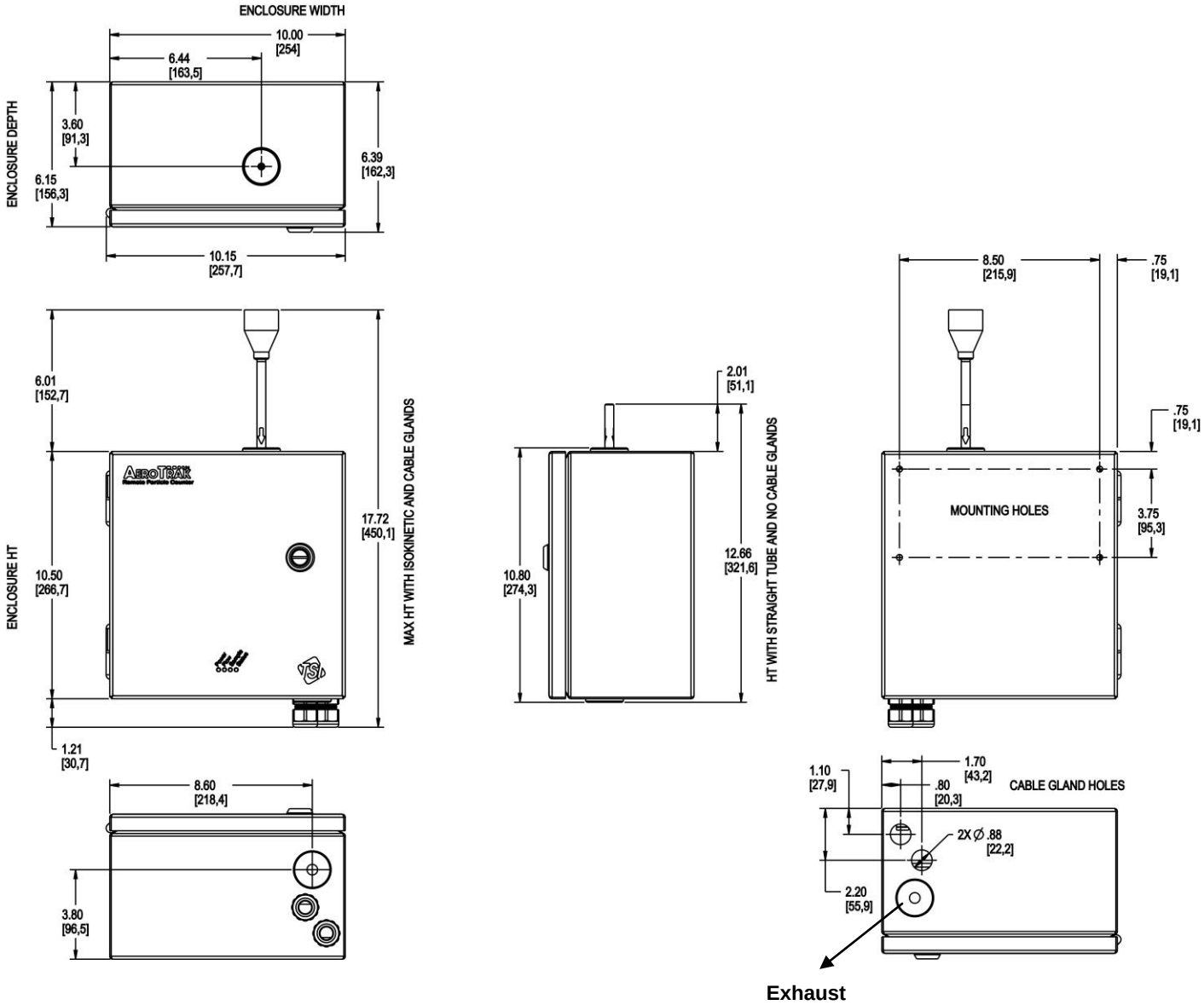
*Patent Number 6,167,107

Specification	Description
External Surface	316L Passivated Stainless Steel
Applicable Standards	CE, JIS B9921, ISO 21501-4
Operating Conditions	36° to 104°F (2° to 40°C) 20% to 95% non-condensing
Storage Conditions	14° to 122°F (-10° to 50°C) / 20% to 98% non-condensing
Included Accessories	316L Stainless Steel Isokinetic Sample Probe Inlet, Probe Cap and Chain, 316L Stainless Steel Inlet, Flexible Sample Tubing, Operating Manual on CD
Optional Accessories	24 VDC Power Supply, Zero Filter

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

TSI Incorporated – Visit our website **www.tsi.com** for more information.

USA	**Tel:** +1 800 874 2811	**India**	**Tel:** +91 80 67877200
UK	**Tel:** +44 149 4 459200	**China**	**Tel:** +86 10 8219 7688
France	**Tel:** +33 4 91 11 87 64	**Singapore**	**Tel:** +65 6595 6388
Germany	**Tel:** +49 241 523030		

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