

DUSTTRAK™ ENVIRONMENTAL MONITOR

OPERATION AND MAINTENANCE MANUAL

P/N 6012056, REVISION A
AUGUST 2018



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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;
- b. DustTrak Environmental pump for Models 8540, 8540-M, 8542-M, 8543, and 8543-M is warranted for two (2) years or 8760 hours, whichever comes first.
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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 (800) 680-1220 (USA) or (001 651) 490-2860 (International) or visit www.tsi.com.

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Safety Information



WARNINGS

- The DustTrak™ 8540/8540-M/8542-M/8543/8543-M aerosol monitors are not rated for intrinsic safety. The DustTrak monitor, with the Environmental Enclosure, must **NEVER** be operated under conditions where there is a risk of fire or explosion.
- Use of components other than those specified by TSI may impair the safety features provided by the equipment.
- The instrument has been design to be used with batteries supplied by TSI. **DO NOT** use a substitute.

The TSI charger (P/N 801809) has been designed to be used with the battery packs supplied by TSI. **DO NOT** use a substitute charger to charge TSI battery packs.

Old batteries must be properly recycled in accordance with the local environmental regulations.
- When mains power adapters are used, the equipment should be positioned so the mains plug will remain accessible for emergency disconnect.
- **DO NOT** use non-rechargeable batteries in this instrument. Fire, explosions, or other hazards may result.



Cautions

- The enclosure is designed to be water resistant to rain or spray. It has a NEMA rating of 3R and an ingress protection rating of IP44. It is not designed to be waterproof when immersed. Setting it in a pool of water will result in flooding the inner compartment with water. This will severely damage both your DustTrak/DRX aerosol monitor and battery pack. **DO NOT** set the Environmental Enclosure in **water!**
- Any seal that is not properly installed could result in water intrusion inside the enclosure which can damage the instruments and batteries. Follow procedures outlined in this manual for proper installation and regular inspection of all seals.

Note

Prior to using the Battery Pack for the first time, a full recharge is recommended. **Recharging Battery Pack(s) immediately after use (within one hour maximum) is critical to obtaining optimal recharge time, battery health, and battery life.**

Laser Safety

- Models 8540/8540-M/8542-M/8543/8543-M DustTrak monitors are Class I laser-based instruments.
- During normal operation, you will **NOT** be exposed to laser radiation.
- Precaution should be taken to avoid exposure to hazardous radiation in the form of intense, focused, visible light.
- Exposure to this light may cause blindness.

Take these precautions:

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



W A R N I N G

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



W A R N I N G

If the DustTrak monitor is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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 instrument.

1. 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



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 and Warning Symbols



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

	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 electrostatic discharge (ESD) and ESD protection 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.

Chapter 1

Product Overview

TSI's DustTrak™ Environmental Monitors are real-time, near reference aerosol instruments, which can be deployed remotely in under an hour. Housed inside the environmental enclosure is a data-logging, light-scattering laser photometer, which is designed to easily fit inside the environmental enclosure.

In addition to the light-scattering laser photometer, will be a 24 VDC power supply, and possibly an enclosure heater and/or Thiamis™ 1000 telemetry modem, depending on the model number you have purchased.

A support bracket has been added to secure the instrument during shipping and transportation. This support bracket can easily be removed, allowing for removal of the light-scattering laser photometer.



Figure 1: Front view of open enclosure

Near the bottom of the enclosure is a systems power rail. It contains a pair of larger connectors (size 4) which are used to bring power into the DIN rail from Main Line Power, Batteries or Solar Power System. The smaller pairs of connectors (size 2.5) are used to supply power to various instruments in the enclosure. Additional connectors can be added to power additional instruments as needed. These connections are covered in more detail later in this manual.

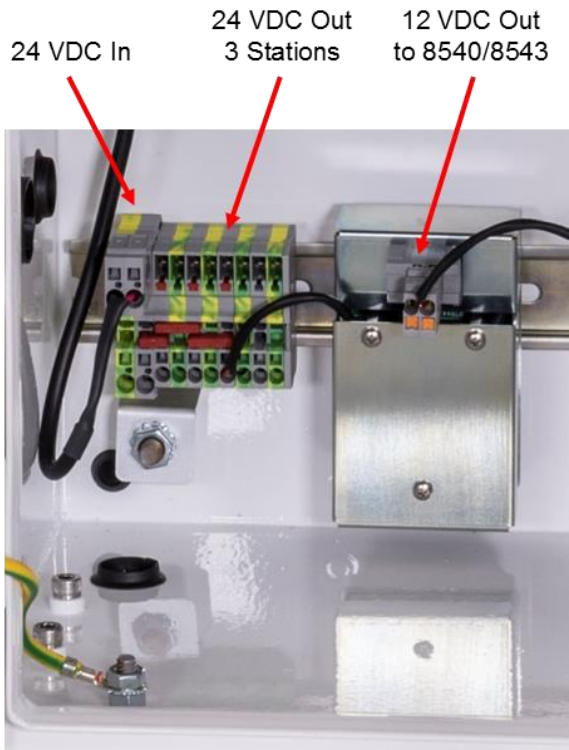


Figure 2: Power strip

Chapter 2

Parts Identification and Unpacking

Carefully unpack the DustTrak™ Environmental Monitor from the shipping container. Use the tables and illustrations below to make certain that there are no missing components. Contact TSI immediately if anything is missing or damaged.

Parts Identification

Identify the parts of the DustTrak Environmental Aerosol Monitor (see [unpacking](#) list below). Please become familiar with these components before proceeding.

Note

Some of these components are identified and described in the DustTrak Environmental Monitor instrument manual. Such as the spare 37-mm sample cassettes.

The DustTrak aerosol monitor, AC power supplies, enclosure heater and Thiamis™ 1000 telemetry modem accessories can now be ordered in multiple configurations, all of which are **pre-installed** into the Environmental Enclosure at the factory. Below are the model numbers and their configurations.

Table 1
Model Number Configurations

Model Number	DustTrak Monitor Description	24 VDC Main Power Supply	300 Watt 24 VDC Power Supply w/Heater	Thiamis™ 1000 Telemetry Modem
854001-1	Single Channel	X		
854002-2	Single Channel		X	
854003-3	Single Channel	X		X
854004-4	Single Channel		X	X
854301-1	DRX version	X		
854302-2	DRX version		X	
854303-3	DRX version	X		X

Model Number	DustTrak Monitor Description	24 VDC Main Power Supply	300 Watt 24 VDC Power Supply w/Heater	Thiamis™ 1000 Telemetry Modem
854304-4	DRX version		X	X
854001-M1	MCERTS PM2.5	X		
854002-M2	MCERTS PM2.5		X	
854003-M3	MCERTS PM2.5	X		X
854004-M4	MCERTS PM2.5		X	X
854201-M1	MCERTS PM10	X		
854202-M2	MCERTS PM10		X	
854203-M3	MCERTS PM10	X		X
854204-M4	MCERTS PM10		X	X
854301-M1	MCERTS DRX version	X		
854302-M2	MCERTS DRX version		X	
854303-M3	MCERTS DRX version	X		X
854304-M4	MCERTS DRX version		X	X

Notes

- “X” indicates an included accessory.
- It is also assumed that an environmental enclosure and the DustTrak Aerosol Monitor is included with each model number.
- An “M” in the model number indicates the instrument has MCERTS certification.





Unpacking

Compare all the components you received with those listed in the table below.

Notes		
<p>Most of these components are pre-installed at the factory. Spare parts of some of the components can be purchased directly from the manufacturers, which are listed below. If any parts are missing, contact TSI.</p>		

Item	Part Number	Description/Qty.
 www.phoenixcontact.com	Spring cage ground terminal block (Green)	Power Connector Ground (Green)
	Large – P/N 3042733	Large – incoming power (1)
	Small – P/N 304002	Small – power distribution (3)
 www.phoenixcontact.com	Feed-through terminal block (Gray)	Power Connector Supply (Gray)
	Large – P/N 3042719	Large – incoming power (1)
	Small – P/N 3040012	Small – power distribution (3)
 <small>REMOVE MIDDLE TANG PRIOR TO INSTALLATION</small> www.phoenixcontact.com	Plug-in Bridge	Power Jumper
	Large, 22.7 mm x 9 mm, two-position P/N 3030161	Large – incoming power to distribution terminal blocks (1)
	Small, 22.7 mm x 14.2 mm, three-position P/N 3030174	Small – to connect terminal block to terminal block (2)
 https://octopart.com/	Small plug	Plug for 0.5" holes
	Heyco® Nylon 0.5" dia Hole Plug, KOS LT 500 P/N 3830	


Item	Part Number		Description/Qty.
 <p data-bbox="140 310 364 331">https://www.heyco.com</p>	Small Plug		Plug for smaller hole on side and bottom of enclosure
	Heyco®-molded break-thru plug, 21mm dia, P/N 9693		
 <p data-bbox="140 509 364 531">https://www.heyco.com</p>	Large Plug		Plug for larger holes on the sides of the enclosure
	Heyco®-molded break-thru plug, 1.093" dia, P/N C2024		
	N/A		7/16" Combo Wrench (1)
	N/A		Mounting Bracket (1)
	N/A		USB Cable (1)
	N/A		Photometer Power Cable (1)
	8540 8543	MCERTS Versions: 8540-M 8542-M 8543-M	DustTrak Environmental Aerosol Monitor (1)
	N/A		AC main to 24 VDC power supply (1)







Item	Part Number	Description/Qty.
	N/A	AC main to 24 VDC 300 Watt power supply with 24V enclosure heater (1)
	N/A	Telemetry Remote Monitoring – Thiamis™ 1000 with GSM/GPS capability (1)
	N/A	Spare Fuse for Thiamis™ 1000 Cable (1)
	1303900 (Nema 5-15 US/JP), 1303901 (CEE 7/7 Euro), 1303902 (Aust/China), 1303903 (BS1362 UK/HK), 1303904 (SEV1011 Swiss)	Region specific power cord for AC main (1)

Environmental Enclosure Optional Accessories

Listed below are optional accessory items for the DustTrak Environmental Monitor. Contact TSI for purchase information.



* Indicates pre-installed factory item, but is also available as a spare or if replacement is needed.

Item	Part Number	Description
	854049	Pole Mount Kit for Ø2" (50.8 mm) to Ø6" (152.6 mm) Poles

Item	Part Number	Description
	854053	Tripod mount
	854048	Solar Shield
	854054*	AC main to 24 VDC 300 Watt power supply, with 24V enclosure heater (includes external power cord)
	854039*	AC main to 24 VDC Power supply for DustTrak monitor (includes external power cord)
	854041	Heated Inlet Sample Conditioner with Omni-directional inlet
	801905*	Thiamis™ 1000 GSM/GPS Modem

Item	Part Number	Description
	854040	Omni-Directional Inlet with water trap
	854020	PM ₁₀ Impactor
	854021	PM _{2.5} Impactor
	854022	PM _{1.0} Impactor
	854050	Lufft WS300 Metrology Station (Temp, Rh, air pressure)
	854051	Lufft WS500 Metrology Station (Temp, Rh, air pressure, wind speed, wind direction)
	854060	12 VDC Solar Power System: 90 Watt panels (2x), mounting kit, 120 Ah battery, cables, and battery enclosure with charging circuit

Item	Part Number	Description
	854036	Internal 12 VDC Battery System: 22Ah Batteries (2x) (801808), battery charger (801809), battery tray, and cable
	801808	12 VDC Battery Pack
	801809	12 VDC Battery Pack Charger
	854046	Replacement O-ring kit
	854055	GM460 Gas Monitor mounting kit with sealing gland
	854056	3 into 1 RS-232 Cable

Item	Part Number	Description
	801903	Wireless Router
	801908	Router Mounting Kit

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Chapter 3

Setting Up

The setup of the Environmental Enclosure is important to reliable and accurate sampling of aerosols in a wide range of conditions. TSI cannot ensure accurate measurements if any of the components are set up incorrectly. Failure to follow these procedures could result in damage to the enclosure or its components.

Note

Each of the optional accessories will be accompanied with its own installation guide. Due to this, installation of these accessories will not be described in full detail within this manual. Be sure to follow the individual installation guides to ensure proper installation.

Assembly

1. Remove the instrument from its packaging.
2. Open the door using a flat blade screwdriver. To do so, turn the screwdriver counter-clockwise.



Figure 3: Opening the enclosure

3. Remove the foam insert in the bottom of the enclosure. The foam insert is used to keep the components from disconnecting from the lower DIN rail during shipping.

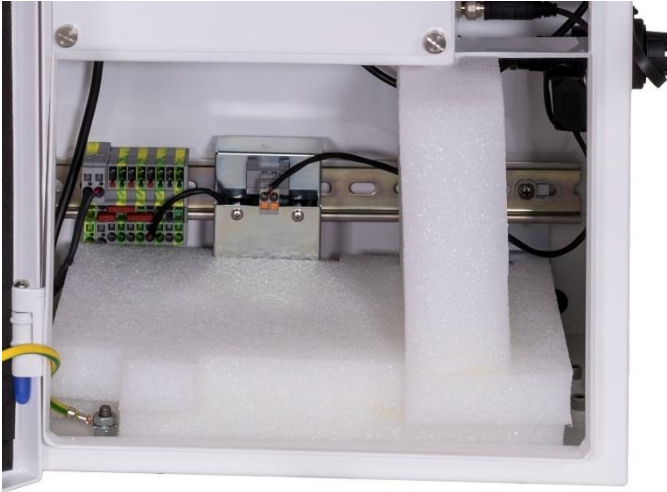


Figure 4: Foam insert

Note

It is recommended to keep the foam insert, for future transportation of the device.

4. Remove the rubber cap on the top of the photometer.



Figure 5: Rubber cap

5. Feed the antenna cables through the fitting and install the Telemetry antenna onto the adapter.

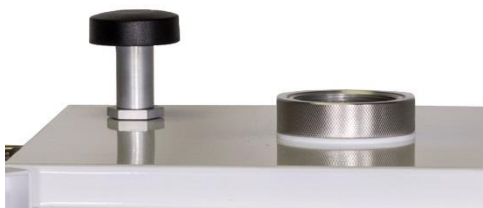


Figure 6: Installing the antenna

6. Attach one of the two possible inlets. Standard omni-directional inlet or heated inlet sample conditioner. Refer to the installation guide provided with the inlet for proper installation.



Figure 7: Inlet attached

7. Attach any of the other optional accessories as required. For example, the pole mount kit and heat shield.
8. Secure instrument to pole or tripod.
9. Connect the external power cord to the outside of the enclosure.
10. Connect the other end of external power cord to AC line power.



Figure 8: Connecting power cord



WARNING

The equipment should be positioned so the mains plug will remain accessible for emergency disconnect.

Note

Line cord plug must be connected to electrical power inside a water resistant/waterproof outdoor receptacle enclosure.



Figure 9: Water resistant/waterproof outdoor receptacle enclosure



WARNING

Improper outdoor installation could result in equipment damage and/or electrical shock due to improper grounding. Installation must follow local electrical codes. Electrical connections should be completed by a licensed electrician.

11. Confirm the blue power light has come on.



Figure 10: Power light

12. If the Thiamis™ 1000 telemetry modem is configured, confirm the LED light has come on.



Figure 11: Thiamis™ modem LED

Note

LED on the modem will blink while the modem searches for a network. If the LED stops blinking and is solid blue, a network has been found and proper communication with Environet® should be possible. If the LED changes to solid yellow, the modem has not found a network. A power cycle may resolve the issue.

Mains AC to 24 VDC (AC/DC Adapters) Power Supplies for DustTrak Environmental Aerosol Monitor

There are two AC/DC options for the DustTrak Environmental Aerosol Monitor. Both of which are pre-installed at the factory.

The standard option is a 24V DC output (120 Watt max) power supply.



Figure 12: Standard AC mains power supply

Power Supply Specifications

Output Voltage	24 VDC
Rated Current	5A
Rated Power	120 W (max)

The second 24 VDC option is a larger power supply (300 Watt max), which includes an enclosure heater for cold climates.



Figure 13: AC mains 300 Watt power supply w/heater

Heater Operating Instructions

1. The heater thermostat is preset, no adjustment or setting is required. Thermostat will turn heater on automatically when the temperature inside the enclosure reaches approximately +5°C (41°F).
2. The thermostat will automatically turn off the heater when the temperature in the enclosure is approximately +15°C (59°F).

Specifications

Nominal Heater Power	24 Volts DC; 100 Watts
Temp Range	Will keep instruments inside enclosure above 0°C (32°F) with outside temperature down to -20°C (-4°F).

DIN Rail and Phoenix Connectors

Power supplied to the Instruments is fed through an assembly of Phoenix Connectors snapped onto the DIN rail. Additional Phoenix Connectors can be purchased directly from www.phoenixcontact.com.

- Green connectors are the “DC ground” connection.
- Gray connectors are the “positive DC voltage” connection.

The pair of larger connectors (size 4) on the far left bring power into the DIN rail from Main Line Power, Batteries, Solar Power System, or Wind Power system.

The smaller pairs of connectors (size 2.5) are used to supply power to various instruments in the enclosure. Additional connectors can be added to power additional instruments as needed.

All “power connectors” require a strong insertion force to fully seat the connector.

The red plug-in bridge clips distribute power from a Gray connector to the adjacent or the next Gray connector. Note the different sizes of red jumper clips.

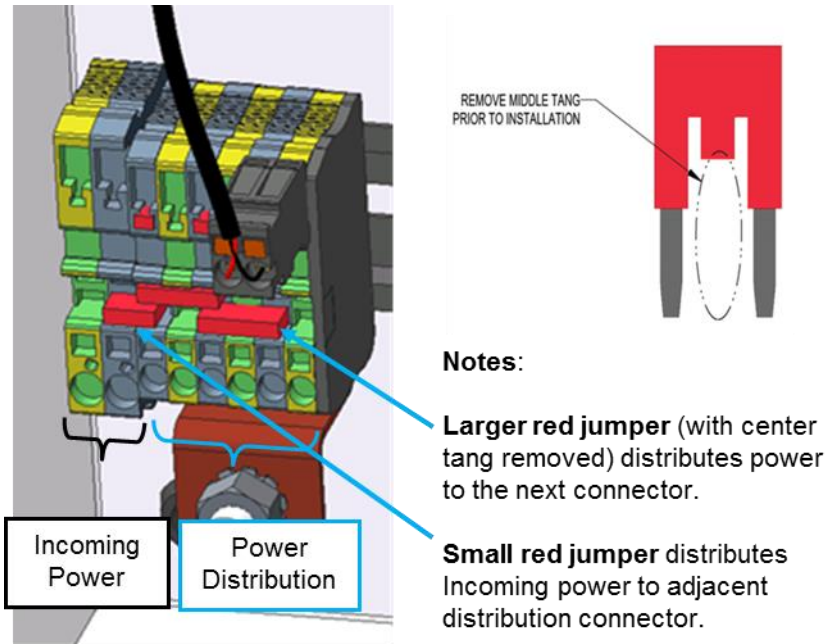


Figure 14: DIN rail and Phoenix connectors.

Replacement connectors can be purchased directly from the manufacturer as follows:

www.phoenixcontact.com

Connector	Part Number
Adjacent jumper (to distribute power from large gray connector to adjacent small gray connector)	3030161
Regular jumper (to distribute power from a small gray connector to another small gray connector)	3030174
Large, Incoming Power Connectors	
Green (DC ground)	3042722
Gray (positive DC voltage)	3042719
Small, Distribution Power Connectors	
Green (DC Ground)	3040025
Gray (positive DC voltage)	3040012

Configuring the Optional Power Supplies

In the event AC mains power is not available, the instrument may be powered with:

1. Optional 12 VDC Battery Packs (P/N 854036).
2. Optional 12 VDC Battery Pack with 90W Solar Panels (P/N 854060).

12 VDC Battery Kit

(Optional Accessory P/N 854036)

See *install guide included with accessory.*

The internal battery system consists of two 22 Amp-Hr rechargeable lead acid batteries with a specially designed charger. A wiring harness draws power from both batteries, doubling the run time. No connection through the outside of the enclosure is required for using the internal battery system.



Figure 15: Battery kit (854036)

Notes

- To integrate the battery into the Environmental Enclosure, the battery will need to be purchased as an optional accessory. Part number 854036 includes: two (2) 22Ahr batteries; battery charger, battery tray, and dual wiring harness.
Additional battery (P/N 801808).
Additional battery charger (P/N 801809).
- Prior to using the Battery Pack for the first time, a full recharge is recommended. **Recharging Battery Pack(s) immediately after use (within one hour maximum) is critical to obtaining optimal recharge time, battery health, and battery life.**
- Use of components other than those specified by TSI may impair the safety features provided by the equipment.



WARNING

The instrument has been designed to be used with batteries supplied by TSI. **DO NOT** use a substitute.

The TSI charger (P/N 801809) has been designed to be used with the battery packs supplied by TSI. **DO NOT** use a substitute charger to charge TSI battery packs.

Old batteries must be properly recycled in accordance with the local environmental regulations.

12 VDC Battery Pack with 90W Solar Panels

(Optional accessory P/N 854060)

See Solar Panel Manual included with accessory.

The solar power system can provide continuous operation in remote locations where AC main power is not present. The system consists of one 120 Amp-Hr rechargeable lead acid battery, with charging controller and its own environmental enclosure for protection from the elements. Additionally, two 90 Watt solar panels, which can be fastened to the ground frame, provide charging for the battery.



Figure 16: Solar power system (854060)

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Chapter 4

Operation

Overview

The Environmental Enclosure can be used in conjunction with the 8540, 8540-M, 8542-M, 8543, or 8543-M DustTrak™ Environmental Aerosol Monitor for many different applications. Its primary use is in outdoor applications to give the DustTrak monitor protection from the elements and the ability to sample efficiently in different wind speeds.

How to Properly Orient the Environmental Enclosure

Set up the Environmental Enclosure in a location where it can sample the particles of interest. It should be placed “out in the open,” away from obstructions which may affect wind currents. For example, do not place it at the corner of a building, which would cause swirling wind currents and result in poor particle sampling.

Use the Environmental Enclosure in wind conditions with speeds of 22 mph or less to obtain the most accurate readings. An increase in wind speed over 22 mph can decrease the sampling efficiency of the inlet to under the efficiency specified by PM₁₀ standards. If wind gusts of over 22 mph are present, the data collected is still valid, but be aware that the readings will be slightly lower than the actual mass concentration of aerosol present.

If the Environmental Enclosure is exposed to direct sunlight, causing the temperature inside to approach the operating limit of 50°C, the Solar Shield should be used. The Solar Shield blocks the direct sunlight, keeping the temperature inside the Environmental Enclosure cooler than it would otherwise be. Orient the Environmental Enclosure with Solar Shield such that the Solar Shield faces the sun directly when the sun is at its highest point in the sky. This will maximize the effectiveness of the Solar Shield.

Checklist for Sampling with the Environmental Enclosure

Before beginning a sample, check to see that all of the following conditions are satisfied:

- ✓ All components are properly installed into the enclosure as described in the [Setup](#) section.
- ✓ The DustTrak Environmental Monitor (8540/8540-M/8542-M/8543/8543-M) has been zeroed at the temperature at which it will be sampling (if possible).
- ✓ The Environmental Enclosure has been put in a place clear of any obstructions that will affect the flow around the enclosure. The Enclosure is not resting directly on the ground (no standing water).
- ✓ The DustTrak Environmental Monitor (8540/8540-M/8542-M/8543/8543-M) has been set to the appropriate survey or logging mode.
- ✓ The Enclosure is locked shut to prevent theft or vandalism to instrument.

Transporting the Environmental Enclosure

When transporting the Environmental Enclosure it is important to store its components correctly. To ensure that no damage is done to the enclosure or its components during transportation, the following steps should be taken:



Attention

The Environmental Enclosure is designed to protect equipment during stationary sampling only.

DO NOT transport or ship equipment (batteries, sensors other than photometer, miscellaneous tools, etc.) inside the environmental enclosure.

1. Remove the inlet from the environmental enclosure.
2. Empty any water from the water trap.
3. Remove RH/Temp sensor for heated inlet accessory (if applicable).
4. Remove batteries (if applicable).
5. Remove any external optional accessories, such as the pole mount kit and/or heat shield.

6. Package enclosure to prevent damage.
7. Package accessories to prevent damage.

Removing Photometer from the Environmental Enclosure for Service or Replacement



Attention

ONLY the DustTrak Environmental aerosol monitor should be returned to TSI for service. **DO NOT** ship the enclosure or any of the other accessories back to TSI for service.

1. Unscrew the top knurled ring/collar from the lower mounting collar.



Figure 17: Unscrew the top knurled ring

2. Remove inlet assembly—either the Omni-directional Inlet or the Heated Inlet Assembly.
 - a. To remove the **Omni-directional Inlet**—lift the entire assembly out after loosening the knurled ring. Skip ahead to step 3.



Figure 18: Remove inlet assembly

- b. To remove a **Heated Inlet Assembly**—the procedure is more complicated. Follow the instructions below:
 - i. Inside the Enclosure, unlock and disconnect the Heated Inlet cable (note that the connector has the lock-release on the top of the connector).



Figure 19: Disconnect heated inlet cable

- ii. Remove the Ferrite Clamp Assembly. Note that the clamp is released by inserting and twisting a small flat blade screwdriver. Also, for purposes of re-assembly, note that the cable twists two times through the Ferrite.



Figure 20: Removing ferrite clamp assembly

- iii. Carefully pull the Heated Inlet Assembly up.



Figure 21: Pull heated inlet assembly up

- iv. Carefully pull the Heated Inlet cable connector through the slot in the Mounting Ring. Now the Heated Inlet Assembly can then be completely removed.



Figure 22: Removing heated inlet assembly

3. Disconnect all cables from the side of the instrument. Such as the USB Cable and Power Cable as shown.



Figure 23: Removing USB and power cables

4. If the heated inlet sample conditioner is installed, disconnect the Temperature/Humidity Sensor Cable.

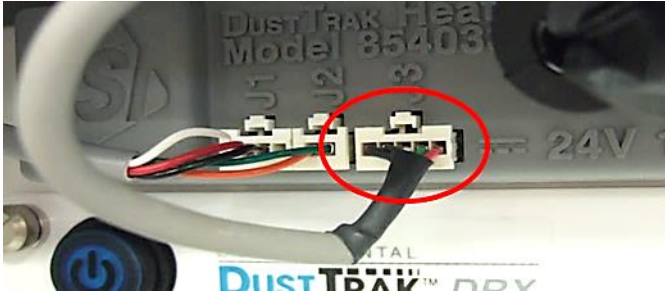


Figure 24: Disconnecting temperature/humidity cable

5. If the Thiamis™ 1000 modem is installed, disconnect the antenna cables from modem.

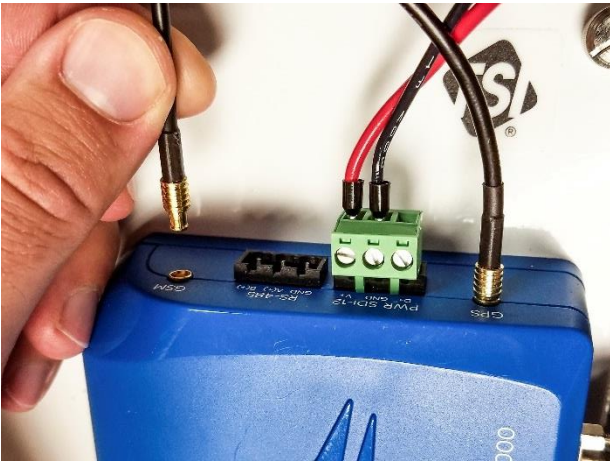


Figure 25: Disconnecting antenna cables from modem

6. Remove the instrument mounting bracket by removing each of the nuts on either side of the bracket. Pivot the bracket down and slide it away from the stud on the left side of the enclosure. The wrench that was shipped with the enclosure can be used to remove bracket nuts.



Figure 26: Removing instrument from mounting bracket

7. Remove the knurled ring while supporting the instrument with your other hand.



Figure 27: Support with hand

8. Remove the instrument from the enclosure. Save the knurled ring and white plastic guide ring for later use.



Figure 28: Removing the instrument from enclosure

9. Remove rubber O-ring from mounting ring and save for later use.



Figure 29: Removing rubber O-ring from mounting ring

10. If the heated inlet sample conditioner is installed, disconnect and remove the cables (as shown in the first two photographs). Then remove the Heated Inlet Controller (bottom photo)—the two highlighted screws use a 7/64" ball driver.



Figure 30: Removing cables and heated inlet controller

11. If the Thiamis™ 1000 telemetry modem is installed, disconnect the modem from the instrument and remove the blue mounting plate.



Figure 31: Removing Thiamis™ 1000 modem

Return Shipping to TSI

Visit our website at <http://rma.tsi.com> to initiate a Return Merchandise Authorization (RMA) form:

- Package the instrument.

Note

Pack the instrument securely in a durable shipping carton to prevent damage during shipment. Consult with courier for packing guidance.

- Include printed copy of RMA form inside container with instrument.
- Ship to TSI via trackable shipping method.



Figure 32: Packaging Example

Installing the Photometer after Service/Repair

1. Remove the Mounting Ring from bottom of inlet column and attach to top of photometer using four (4) screws provided. This step is only required if the mounting ring was removed from the photometer prior to being sent to the factory for service.

Note

Ensure keyhole opening is orientated to the front of the photometer.

2. Install O-ring to mounting ring attached to photometer.

Note

Refer to Figure 33 for steps 2 through 5.

3. Lift photometer up through enclosure, guiding the attached mounting ring through the opening.
4. Place plastic glide ring around mounting ring protruding through top of enclosure.
5. Use the retainer ring to secure the photometer to the enclosure. Hand-tighten retainer ring to mounting ring. **DO NOT** use tools for additional leverage.

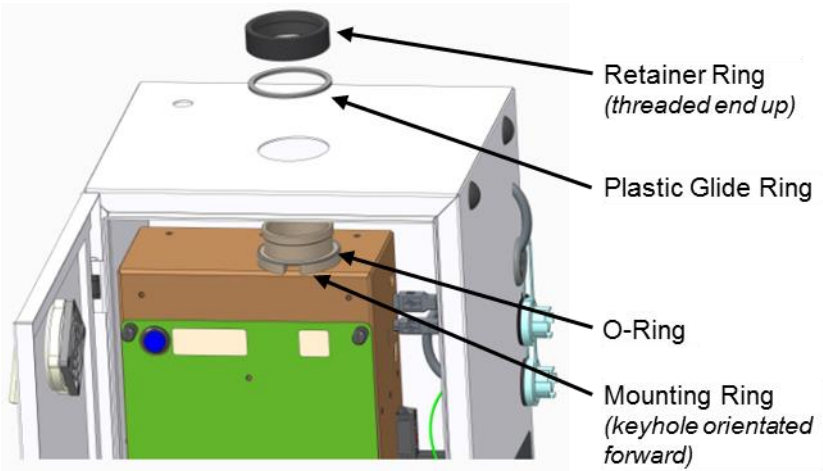


Figure 33: Install DustTrak Monitor – insert inlet ring up through opening



WARNINGS

- Retainer ring and O-ring must be properly orientated to ensure a good seal to prevent water leakage.
- Care must be taken to hold the photometer while tightening or loosening the retaining ring to prevent damage to the photometer from an unexpected drop.

Installing the Inlet Assembly without Photometer

When the photometer is removed from the enclosure, the top of the enclosure will have an opening unless the Inlet Assembly is reinstalled. If the Enclosure is to be left outside, follow the steps below to re-install the Inlet-Assembly column to the mounting ring from the DustTrak monitor to ensure a waterproof seal on the enclosure.

1. Remove the mounting ring from the photometer. Save the four screws for reinstallation of the mounting ring on the photometer.



Figure 34: Remove mounting ring from photometer

2. Install the Mounting Ring from below into the top opening of the environmental enclosure. Install the Plastic Glide Ring on the bottom and then the knurled Retainer Ring. Tighten the Retainer Ring until tight.



Figure 35: Secure retainer ring



WARNINGS

- Retainer ring and O-ring must be properly orientated to ensure a good seal to prevent water leakage.
- Inspect all O-rings for damage and contamination during installation to ensure a good seal to prevent water leakage.

3. If you have a Heated Inlet Assembly, first feed the Temperature / Humidity Sensor cable through the slot in the Mounting Ring. Carefully feed the cable through the opening as you lower the Heater Inlet onto the Retaining Ring.



Figure 36: Heated Inlet cable

4. Note that the bottom of the Heated Inlet Assembly or Omni-directional Inlet has a “guide-hole” which must align with the alignment pin in the Mounting Ring. Rotate the Inlet Assembly back and forth until the hole aligns with the pin.



Figure 37: Aligning inlet assembly

5. Insert the Heated Inlet or Omni-directional Inlet fully. Firmly tighten the knurled ring of the Heated Inlet or Omni-directional Inlet. This completes the installation of the Heated Inlet or the Omni-directional Inlet assembly.



Figure 38: Secure inlet column to retainer ring

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Chapter 5

Maintenance

Bi-Annual Maintenance Checks

Note

Extreme conditions may require more frequent maintenance. Suggestion, every month.

1. Check the gasket around the door for proper seal.
2. Check the door vents for tightness and filters in place.
3. Ensure the photometer is secured to the enclosure with the retainer ring.
4. Ensure the Omni-directional inlet column is secured to the photometer by the column retainer ring.
5. Empty the water trap if needed.
6. Ensure all cable grommets and whole plugs through environmental enclosure are snug and weather tight.
7. Ensure all internal wiring and cable routing tie wraps are properly secured to the enclosure.
8. Inspect internal wiring and cables for loose connections and damaged wires and cables.
9. Ensure wires and cables are not routed on top of heater at risk of melting (if used).
10. Ensure enclosure is securely mounted to Pole Mounting Kit or other fixture and any attachment point.
11. Ensure enclosure is securely locked to prevent theft.

Monthly Cleaning of the Inlet

Under normal operating conditions, the external aerosol inlet will remain clean and unobstructed. Under dirty conditions; however, the inlet may become obstructed with vegetative debris or insects.

To ensure the inside of the aerosol inlet is clean, periodically remove Omni-directional inlet and blow compressed air through the bottom of the inlet. It is recommended to do this on a **monthly** basis.



Figure 39: Blowing compressed air through the inlet

1. Remove the top part of the inlet and clean the surfaces where debris and dirt can collect.
2. Apply a small of thread lubrication to the collar to prevent corrosion. Be sure not to apply too much otherwise it may enter the instrument and cause damage.



Figure 40: Cleaning near the water trap

Emptying the Water Trap

If any water or moisture has accumulated in the water trap, unscrew the water trap from the Omni-directional inlet and empty it.

The bottle must be securely hand tightened to seal against the O-ring to prevent leaking. Make sure the tightly secured bottle is oriented in the position shown in Figure 41.

If water trap top is removed from fitting, re-apply Teflon[®] pipe tape to fitting before installing cap to ensure a good seal is maintained.

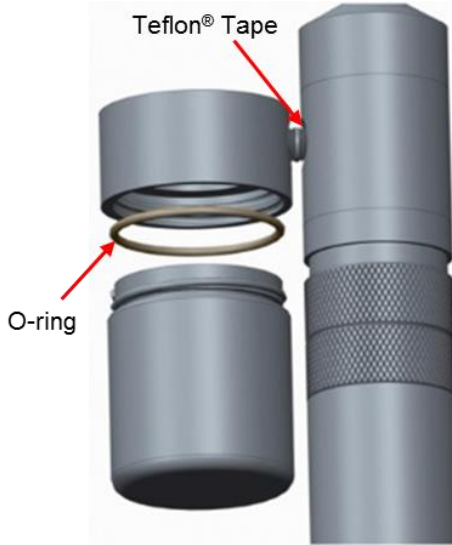


Figure 41: Water trap O-ring and Orientation on inlet column

Cleaning and Oiling Impactors

Follow the recommended Impactor cleaning interval for size selective Impactors used with Models 8540, 8540-M, and 8542-M DustTrak Environmental instruments shown below.

Recommended impactor maintenance interval is every two months except where the “average dust concentration” level indicated in the table shows the impactor should be cleaned more frequently:

Average dust concentration (mg/m ³)	Impactor maintenance interval
0.015	97 days
0.025	60 days
0.035	42 days
0.050	30 days
0.100	16 days
0.150	10 days
0.250	6 days
0.400	4 days

1. Unscrew Impactor. Check O-ring on the Impactor base.
2. Clean outside and inside of Impactor and the Impactor plate using a clean brush and a light solvent. Dry impactor parts by blowing it out with compressed air, or let it air-dry thoroughly.
3. Apply two drops of oil (included) to the impactor plate. **DO NOT** over-fill impaction plate.

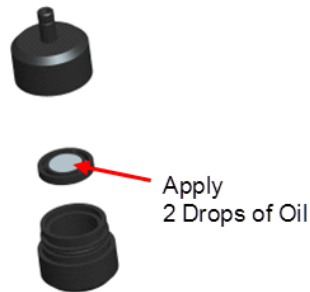


Figure 42: Apply 2 Drops of Oil to Impactor Plate

4. Screw (hand-tighten) impactor back together.

Chapter 6

Troubleshooting the Environmental Enclosure

The table below lists the symptoms, possible causes and recommended solutions for common problems encountered with the DustTrak™ Environmental Enclosure.

Possible Cause	Corrective Action
Photometer does not turn on.	
Bad Power Connection	Check all power connections from the outside of the Enclosure to the Photometer. If a battery is used, check the connection to the batteries.
Readings are unusually low.	
Zero was not checked on DustTrak monitor.	Re-zero DustTrak monitor at desired sampling conditions.
Plugged external inlet.	Remove inlet from the Enclosure; blow out debris with compressed air. Rinse with clean air, if needed. Take off water trap bottle and clean all exposed surfaces.
Sampling in wind speeds over 22 mph.	DustTrak monitor will under-sample slightly in high wind speeds. No correction possible.
Enclosure located near an object that obstructs the flow.	Move the Environmental Enclosure into a more open area.
Leak in the inlet.	Make sure the upper inlet assembly and the water trap are screwed in tightly. Make sure tubing is secured on the enclosure barb and the DustTrak monitor. Make sure inlet assembly O-ring is in place.

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Appendix A

Specifications

Specifications are subject to change without notice.

Environment Enclosure

Sampling Conditions																							
Wind Speed	0 to 22 mph (0 to 36 kph)																						
Operating Temperature	32 to 120°F (0 to 50°C)																						
Operating Temperature with Heater accessory Model 854054	-4 to 120°F (-20 to 50°C)																						
Storage Temperature	-4 to 140°F (-20 to 60°C)																						
Ingress Protection	IP44 IP54 with vent plugs installed																						
Physical																							
External dimensions with no sample inlet (HWD)	16 x 12 x 12.25 in. (411 x 305 x 311 mm)																						
Approximate Weight	Enclosure (empty) 20 lbs (9.07 kg)																						
Approximate weight of accessories	<table border="0"> <tr> <td>DustTrak Environmental monitor</td> <td>5 lbs (2.27 kg)</td> </tr> <tr> <td>Thiamis™ 1000 Kit</td> <td>1 lbs (0.45 kg)</td> </tr> <tr> <td>Internal Battery Kit</td> <td>30 lbs (13.6 kg)</td> </tr> <tr> <td>Heated Inlet Sample Conditioner</td> <td>2 lbs (0.91 kg)</td> </tr> <tr> <td>Enclosure Heater Kit</td> <td>4 lbs (1.81 kg)</td> </tr> <tr> <td>Omni inlet w/water jar</td> <td>2 lbs (0.91 kg)</td> </tr> <tr> <td>Power Supply.....</td> <td>2 lbs (0.91 kg)</td> </tr> <tr> <td>Solar shield</td> <td>2 lbs (0.91 kg)</td> </tr> <tr> <td>Pole Mount Kit</td> <td>6 lbs (2.72 kg)</td> </tr> <tr> <td>Lufft WS300</td> <td>2 lbs (0.91 kg)</td> </tr> <tr> <td>Lufft WS500</td> <td>3 lbs (1.36 kg)</td> </tr> </table>	DustTrak Environmental monitor	5 lbs (2.27 kg)	Thiamis™ 1000 Kit	1 lbs (0.45 kg)	Internal Battery Kit	30 lbs (13.6 kg)	Heated Inlet Sample Conditioner	2 lbs (0.91 kg)	Enclosure Heater Kit	4 lbs (1.81 kg)	Omni inlet w/water jar	2 lbs (0.91 kg)	Power Supply.....	2 lbs (0.91 kg)	Solar shield	2 lbs (0.91 kg)	Pole Mount Kit	6 lbs (2.72 kg)	Lufft WS300	2 lbs (0.91 kg)	Lufft WS500	3 lbs (1.36 kg)
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Pole Mount Kit	6 lbs (2.72 kg)																						
Lufft WS300	2 lbs (0.91 kg)																						
Lufft WS500	3 lbs (1.36 kg)																						

Maintenance Requirement			
Maintenance Check/ Clean omni-directional inlet	Average Dust Concentrations		
	35 µg/m ³	50 µg/m ³	100 µg/m ³
	42 days	30 days	16 days
Internal Battery System			
Battery Run-time	DustTrak/DRX Environmental Photometer:		
	Single battery	21 to 24 hours (typical)	
	Dual batteries	42 to 48 hours (typical)	
	DustTrak/DRX Environmental Photometer (with heated inlet accessory):		
	Single Battery	15 hours (typical)	
	Dual Batteries	30 hours (typical)	
Battery Charge Time	8 to 9 hours at 72°F (22°C) (New battery, deep discharge to 95% charge)		
AC and DC Power Requirements			
AC Power	100 to 240 VAC, 50/60 Hz, 120 W Maximum (300 W Max for power supply included with Enclosure Heater)		
DC Power (solar option)	12 VDC, 50 W Maximum		

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Thank you for reading this data sheet.

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Please note - Product designs and specifications are subject to change without notice. The user is responsible for determining the suitability of this product.