

## DustTrak User's Guide January, 2012

The DustTrak is used to measure and record the amount of fine particulate matter (PM) in the air including smoke concentrations.



**Figure 1: DustTrak outside Environmental Enclosure**

This Guide explains:

- The components of each DustTrak monitoring unit
- Pre-field deployment maintenance
- Items to take to the field for a monitoring run
- Where to site the DustTrak to collect smoke data
- How to set up the DustTrak components for field operation
- How to configure the DustTrak for field monitoring
- How to start a monitoring run
- How to stop a run and download data
- How to disassemble and transport the instrument
- How to store the DustTrak equipment
- Miscellaneous instrument quirks to be aware of

## **Section 1: UCR DustTrak Equipment**

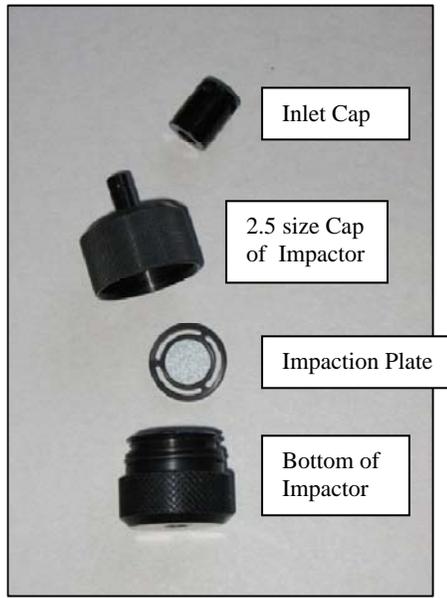


**Figure 2:**

**DustTrak Monitoring Unit: DustTrak Carrying Case (left) and Environmental Enclosure (right) (Note that each unit is assigned a unique number)**

UCR owns 4 DustTrak aerosol monitors and associated equipment (Figure 2). Each of these units have been assigned a unique identification number and must include the following:

- Carrying Case which should contain the following:
  - DustTrak monitor (Figure 1)
  - PM2.5 Impactor with Inlet cap (Impactor is made up of three components. See Figure 3)
  - Power Supply
  - Zero Filter (see Figure 7)
  - Zippered Pouch with accessories and tools including vacuum grease
  - Operation manuals for monitor and environmental enclosure
  
- Environmental Enclosure which should include the following
  - Inlet Assembly (See Figure 6 – blue stack with “flat hat”)
  - Water trap bottle
  - Internal DC Power cable
  - Transport Inlet Plug (pencil glued to red plug used to plug hole from the outside of environmental enclosure)
  - Velcro Straps
  - 12 VDC Power Adapter (attached to outside of enclosure)



**Figure 3: PM2.5 Impactor with Inlet cap. Note that silver side of impaction plate is placed facing up inside impactor assembly.**

## **Section 2: Pre-field Deployment Maintenance**

Before you leave for the field, clean and oil the PM2.5 Impactor as follows:

- Unscrew the Impactor. There will be three parts (Figure 3). Check the integrity of the o-ring on the impactor base and replace as needed
- Clean outside and inside of Impactor and impactor plate using a clean brush and light solvent (isopropyl alcohol will work). Dry thoroughly either with compressed air or allowing to air-dry
- Apply no more than 2 drops of oil (provided and kept in blue zippered accessory pouch) to impactor plate. Do NOT over-fill impactor plate.
- Screw impactor back together, **hand tighten**.

## **Section 3: Items to Take to the Field**

- Carrying Case with monitor and supplies (see Page 2)
  - The monitor is a sensitive instrument and MUST be transported inside carrying case, **NEVER** in the Environmental Enclosure.
- Environmental Enclosure with supplies (see Page 2)
- Outdoor extension cord (at least 50')
- Small table, flat surface or other plan to get instrumentation at least 3 feet from ground surface. Surface should be stable and not prone to tipping over due to wind or being bumped by a passing person or animal.

## **Section 4: Siting the DustTrak**

The DustTraks should be a minimum of 3 feet off the ground and away from objects that would influence free air flow (such as buildings or trees). Tops of buildings are appropriate sites.

The monitoring site should preferably be located where is is not influenced by local road dust, emissions from wood burning stoves, industrial pollutants (such as oil and gas exploration or development sites) or other sources of particulates unrelated to wildland fires. If these pollution sources cannot be avoided, record what each source is and the days and hours they are likely in use.

Site each DustTrak downwind of the burn in an areas of particular interest. These may include populated communities or sensitive areas such as hospitals, schools or nursing homes.

Where a prescribed burn is planned, acquire ambient air quality data at the monitoring site(s) for several days prior to igniting the burn. This helps document patterns of background pollution that is not attributed to the burn.



**Figure 4: DustTrak Environmental Enclosure mounted on tripod**

## **Section 5: Setting up DustTrak Components for Field Operation**

- ❑ Place Environmental Enclosure on a flat surface that is at least 3 feet off the ground. If you have a survey tripod available, you can mount the Environmental Enclosure to it (Figure 4).
- ❑ Install the DustTrak inside the Enclosure and secure with both Velcro straps.
- ❑ Attach power cable to DustTrak. (There are two connections to the power cable but only one will fit into the power inlet located on the right side of the instrument).
- ❑ Install water trap bottle (Figure 5). Before screwing bottle into inner inlet ring, grease the X-ring found in the bottom of the threaded hole (use just a tiny bit vacuum grease that is included in the zippered pouch in the Carrying Case). This ensures an air tight seal.
- ❑ The PM2.5 impactor (with all three components) should be previously installed on the instrument. If not, install now. Remove inlet cap and place in a safe location (suggest leaving it in Environmental Enclosure)
- ❑ Unscrew the Aerosol Sample Inlet Assembly stored in the lid of the Enclosure. Close Enclosure and remove the red transport inlet plug.
- ❑ Apply a thin film of vacuum grease to the Inlet Assembly o-ring.
- ❑ Thread Inlet Assembly into inlet ring located on the outside of the Enclosure (Figure 6). Often this will require that you press down to seal the o-ring inside the Inlet. Hand tighten Inlet Assembly.
- ❑ Plug in AC/DC adapter into power source using extension cord where necessary.
- ❑ You are now ready to configure the DustTrak for monitoring.



**Figure 5: Installation of water trap bottle and inlet tubing**



Figure 6: Aerosol Sample Inlet Assembly threaded into Inlet Ring

### **Section 6: Configuring DustTrak for Monitoring**

Open Enclosure and turn on DustTrak if not already powered up. It will take about one minute for the Start Up menu to display.

#### **Zero Calibration**

Instrument must be zero calibrated prior to every monitoring session.

**!!! NEVER** perform a zero calibration without first attaching a zero filter.

To zero calibrate:

- Attach zero filter to inlet of DustTrak (Figure 7)
- In Main menu display press “Setup”
- In Setup menu display press “Zero Cal”
- Press start. Calibration should take about one minute.
- Wait for message on screen, “Zero calibration is complete”
- Remove zero filter and attach inlet tubing to Impactor inlet (Figure 5)
- Press “Main” to return to main menu



Figure 7: Zero filter attached to Impactor inlet

## Other Setup Options

Other than the Zero Cal function, check that rest of the setup options are as follows:

- FlowCal (Factory at 1.00)
- User Cal 1.00 - see below
- Alarm should be Off
- Analog should be Off

There seems to be a problem with UserCal. If you change it, everything will look fine including the flow cal. But when you do a run both the user cal and flow cal will report out at whatever you set the user cal to be. To work properly, the machine needs to run at full flow. So instead, multiply the output data by 0.32 and leave the user cal set at 1.00. To learn more about why to adjust the data see MTDC's evaluation of smoke monitors: [www.fs.fed.us/t-d/pubs/htmlpubs/htm06252842/page07.htm](http://www.fs.fed.us/t-d/pubs/htmlpubs/htm06252842/page07.htm).

## RunMode

This should be preset. Check to be sure the following parameters are entered and adjust as needed:

- In Main menu press "RunMode"
- In RunMode menu choose "Manual" in first pull down menu
- In RunMode open second pull down menu. "Time Length", "Log Interval" and "Time Constant" should be set as follows:
  - o Test Length: 90:00:00
  - o Log Interval: 05:00 (*this logs data every 5 minutes*)
  - o Time Constant: 60 sec (*this pertains to the screen refresh to save power*)

## **Section 7: Starting a Monitoring Run**

Once the DustTrak is zeroed and the Setup and RunMode are configured press the Green **Start** button on the Main Menu display.

For more information on the Menu display during a run including Stats and Graphs, see the Operation and Service Manual kept in the mesh pouch of the Carrying Case.

## **Section 8: Terminating a Run and Downloading data**

The DustTrak records data which can be downloaded to a computer or a thumb drive. If downloading directly to a computer, use the USB cable found in the Environmental Enclosure to connect to the monitor. Prior to downloading logged data from a DustTrak monitor, the TrakPro software must be installed onto your

computer. This software is on a CD and kept in the mesh pocket of the Carrying Case. If it is not there, check another Carrying Case.

Before downloading a data file the DustTrak **cannot** be in sampling mode. To end a sampling mode, press the Red **Stop** button and hit the “Yes” button when it appears on the display screen.

Option 1. Use the USB cable found in the Environmental Enclosure. Prior to downloading logged data from a DustTrak monitor, the TrakPro software must be installed onto your computer. This software is on a CD and kept in the mesh pocket of the Carrying Case. If it is not there, check another Carrying Case.

Attach the USB cable from the DustTrak to a computer and download the data file using the TrackPro software. This software allows for graphical or tabular display of data and can be used to compile a monitoring report.

Option 2. Bring a thumb drive to the field, not a whole computer.

- Stick any standard thumb drive into the port on the left side of the monitor.
- From the main menu display choose Data.
- Choose Save All. When the machine is done saving, the screen will have a message that says so.
- Bring the thumb drive back to a computer and plug it in.
- Open a spreadsheet program like Excel.
- Import the comma-delimited .csv file. The relevant file name will start with 'Manual'.
- Examine and/or graph the data. Before it are several rows of metadata including the date and time the run started.

## **Section 9: Disassembling and Transporting the DustTrak Equipment**

After completing a monitoring run disassemble applicable DustTrak components and transport properly. Follow these steps:

- Unscrew Aerosol Sample Inlet Assembly from inlet ring
- Securely screw the Inlet Assembly back into the transport bracket located inside the cover of the Environmental Enclosure
- Plug the opening in the inlet ring with the red plug that is glued to a small pencil.
- Inside the Environmental Enclosure unplug the DustTrak from the inlet tubing, USB cable and power cable.
- Plug the impactor inlet with the inlet cap (should have been left inside Environmental Enclosure)
- Remove the DustTrak monitor from the Enclosure and place back in the Carrying Case.

- Unscrew the water trap bottle and empty if needed. Recap and return to the Carrying Case.

### **Section 10: Storing DustTrak Equipment**

When storing the DustTrak for more than 30 days, charge and remove the batteries to prevent damage from battery leakage. Store in a location where the temperature remains between -4.0° and 140°F.

### **Section 11: Miscellaneous Bit and Pieces**

#### **Rechargeable Battery (quirks in the design)**

- The DustTrak does not need the inner battery installed in order to operate. However, it can be useful in instances where AC current is interrupted.
- When the DustTrak is sampling, the battery will not be recharged even when the instrument is plugged into a power source. The battery also cannot be charged using the Power Adapter associated with the Environmental Enclosure. In fact, the only way to recharge the battery is to remove the DustTrak from the Environmental Enclosure and plug it in to AC current using the Power Supply cord located in the Carrying Case.
- **It is helpful to power up the monitor's battery one or two days before deployment of instrument. This is also a good time to clean and oil the impactor as described in Section 2.**