

DustTrak DRX Quick Start Guide

Version 1.0 – February 26, 2016



1 INTRODUCTION

The TSI DustTrak DRX is an instrument that USEPA Region V has been outfitted with to replace the ThermoScientific DataRAM 4. Like the DataRAM 4, the DustTrak DRX is an aerosol monitor that is used to monitor particulates in the air. The DustTrak DRX comes enclosed in an environmental enclosure to protect the unit from the elements.

Note: This document is a working document and will be updated as wireless telemetry is developed for this instrument.

Exterior of DustTrak with Omnidirectional Hood Attached



1) Omnidirectional Hood

Exterior Side View A



- 1) SMA Male Connections (x2)
- 2) SMA Female Connections
- 3) External Battery Connections

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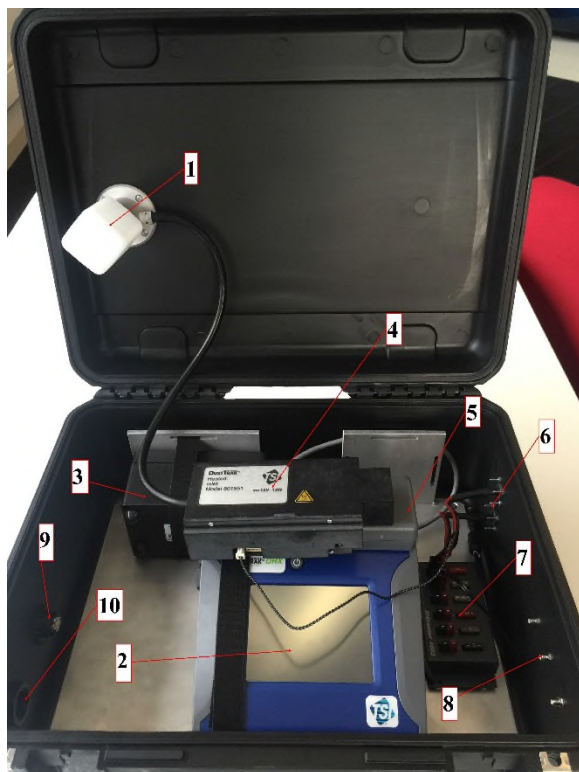


Exterior Side View B



- 1) USB Inlet
- 2) Temperature Sensor Inlet

Interior View



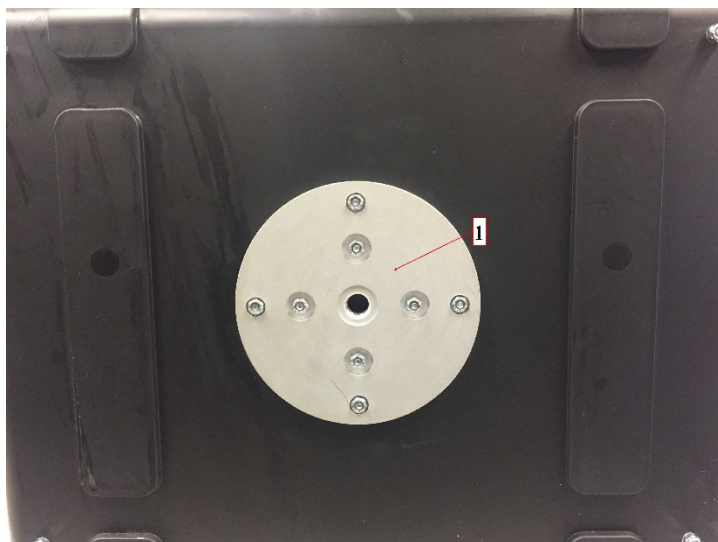
- 1) Water Trap
- 2) TSI DustTrak DRX
- 3) External Pump Module
- 4) Heated Inlet Sample Conditioner
- 5) Auto Zero Module
- 6) External Battery Connections (x2)
- 7) External Battery Fuse Panel
- 8) SMA Connections (x3)
- 9) USB Connection
- 10) Temperature Sensor Inlet

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Exterior Bottom View



1) Survey Tripod Mounting Plate

2 OPERATION

The Operation section will discuss how to set up the EPA DustTrak DRX units, conduct air monitoring, and download the data from the units.

2.1 Connecting the DustTrak DRX to Power

The EPA DustTrak DRX units do not have rechargeable battery packs installed. As a result, the units must either be powered with the wall charger or with the external battery packs.

2.1.1 *Powering the DustTrak DRX with the Wall Charger*

The EPA DustTrak DRX units can be plugged into any standard wall outlet or generator with the wall charger. However, when the unit is plugged into the wall charger, the lid on the environmental enclosure will not be able to close fully. As a result, it is never recommended that the unit be powered with the wall charger while outside or where it will be exposed to a wet environment.

In order to connect the unit to the wall charger, you must plug the wall charger into the power inlet, located on the right of the unit. When the wall charger is plugged into the wall, the unit will start up automatically.

DustTrak DRX Power Inlet Location



2.1.2 *Powering the DustTrak DRX with External Batteries*

Another option that is available on the EPA DustTrak DRX units is the ability to power the units with external batteries.

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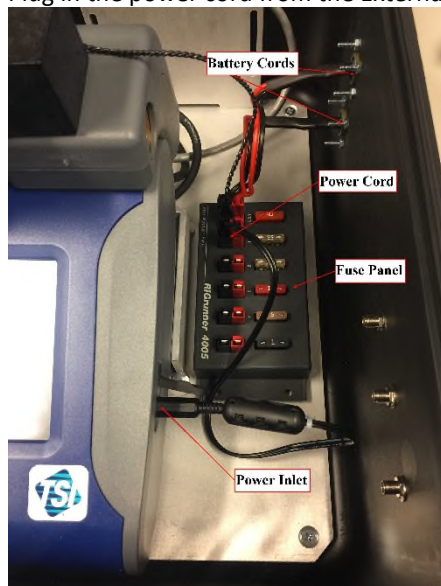


In order to connect the unit to external batteries:

1. Connect the external batteries to the battery connections on the outside of the Pelican case. (Batteries not shown)



2. Plug in the power cord from the External Battery Fuse Panel to the Power Inlet on the unit.



3. Once the unit is connected to power, the unit should start up automatically.

2.2 Turning on the DustTrak DRX

As mentioned in the previous section, the EPA DustTrak DRX units should start up automatically once connected to a power source. However, in the event that the unit does not start up automatically, the unit can be manually turned on by pressing and holding the On/Off button, located at the top of the touchscreen.

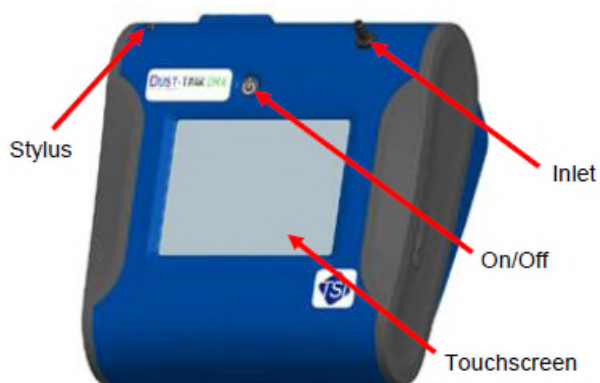
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Note: On the EPA DustTrak DRX units, the On/Off button is located beneath the Heated Inlet Sample Conditioner.

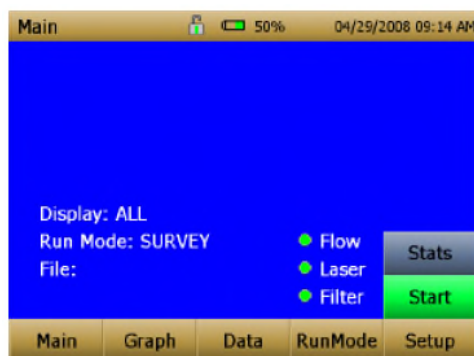
DustTrak DRX Front View



2.3 Setting Up the EPA DustTrak DRX

When the DustTrak DRX is powered on, the Start Up Screen will be the first screen the operator sees.


DustTrak DRX Start Up Screenshot



2.3.1 Title Bar

On the top of the Start Up Screen is the Title Bar. The Title Bar provides the operator with information regarding the instrument lock and the time and date. The EPA DustTrak DRX units are not equipped with Alarms, but an alarm icon would appear in the Title Bar if they were. Also, since the EPA DustTrak DRX units are either powered by the wall charger or external batteries, a Battery Status Icon will not appear on the Title Bar.

Instrument Lock

In order to lock the touchscreen, press the  icon, immediately followed by three quick touches on the "Main" word on the Title Bar. Repeat the process to unlock the touchscreen.

2.3.2 Options Bar

The Options Bar is located on the bottom of the Start Up Screen. The Options Bar consists of the Main, Graph, Data, RunMode, and Setup Options. The Start/Stop and Stats Buttons are located directly above the Options Bar and will be addressed in this section.

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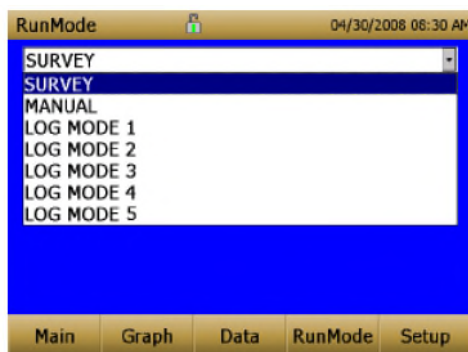
2.3.2.1 *Main Button*

Pressing the Main Button with a stylus or finger allows the operator to navigate back to the Start Up/Main Screen from any other screen.

2.3.2.2 *RunMode Button*

The RunMode Button allows the operator to select between Survey Mode, Manual Mode, and Log Mode. To toggle between the Run Modes, press the top option bar and then the desired Run Mode.

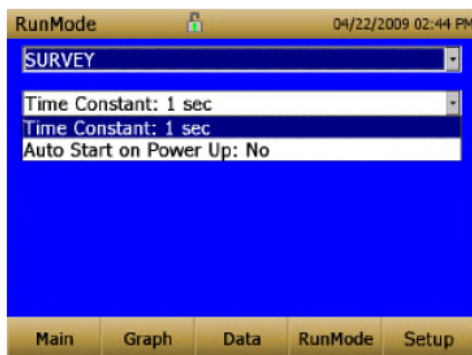
RunMode Screenshot



2.3.2.2.1 *Survey Mode*

In Survey Mode, the DustTrak DRX will run a continuous active sample in real time. However, the unit will **NOT** datalog in Survey Mode.

Survey Mode Screenshot



2.3.2.2.2 *Manual Mode*

In Manual Mode, the operator has the ability to log data for an air monitoring event. The operator also has the ability to define the parameters for the run including the run time, the log intervals, and update rate of the main screen during the event (Time Constant).

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Test Length

Test Length is also known as the run time for an air monitoring event. The operator can set the Test Length by pressing it on the screen a screen will show up with the length of the run displayed in hours: minutes: seconds (00:00:00). Adjacent to each of the time units are up/down arrows that allow the operator to change the length of the run. Once the Test Length has been set to the desired time, press the Save button.

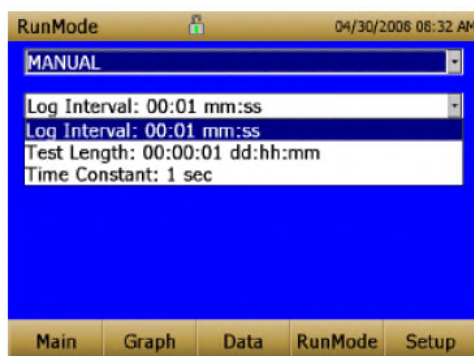
Log Interval

Log Interval is the amount of time between logged data points and is displayed in minutes: seconds (00:00). Adjacent to each of the time units are up/down arrows that allow the operator to change the interval length. Once the Log Interval has been set to the desired time, press the Save button.

Time Constant

As mentioned above, the Time Constant controls the update rate of the information displayed on the Main Screen during an Air Monitoring Event. Time Constant is displayed in seconds and can be set between 1 to 60 seconds. Adjacent to the number of seconds are up/down arrows that allow the operator to change the Time Constant. Once the Time Constant has been set to the desired time, press the Save Button.

Manual Mode Screenshot



2.3.2.2.3 Log Mode

Like in Manual Mode, the operator has the ability to log data in the Test Modes. However, In the Test Modes, the operator has the ability to set specific times at which air monitoring events will automatically be run. The operator also has the ability to perform multiple air monitoring events of the same length with a specified time between tests

Log Name

By pressing Log Name, the operator has the ability to change the name that the air monitoring event will be saved under. When Log Name is pressed, a QWERTY keyboard will appear showing allowing the operator to type out a new name for the file.

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Start Date

By pressing Start Date, the operator has the ability to change the date the air monitoring event will start. Up/down arrows will appear adjacent to each portion of the date. Once the date has been set, press the Save button.

Start Time

By pressing Start Time, the operator has the ability to change the time the air monitoring event will start. Up/down arrows will appear adjacent to each portion of the time. Once the time has been set, press the Save button.

Log Interval

Like in Manual Mode, the Log Interval can be changed in Log Mode. Follow the same procedures as in Manual Mode.

Use Auto Zero

The EPA DustTrak DRX units are equipped with Auto Zero Modules. As a result, the units are capable of automatically conducting zero calibrations during an air monitoring event. It is recommended that the Auto Zero always be enabled during air monitoring events. To toggle between Auto Zero options, press the up/down arrows to the desired status. Once the desired status is selected, press the Save button.

Auto Zero Interval

The Auto Zero option allows the operator to change the interval between automatic re-zeroing events using the Auto Zero Module. The Auto Zero Interval can be changed in the same way as the Log Interval.

Test Length

Like in Manual Mode, the Test Length can be changed in Log Mode. Follow the same procedures as in Manual Mode.

Number of Tests

The Number of Tests option allows the operator to determine the number of air monitoring events will run under the single file name. Pressing Number of Tests brings up a numeric keyboard that allows the operator to press in the desired number. Once the desired number has been entered, press the Save button.

Time Between Tests

The Time Between Tests option allows the operator to set the length of time between each of the tests for the single file. The time can be set between 1 minute to 30 days and is displayed as days: hours: minutes. Adjacent to each of the time units are up/down arrows that allow the operator to increase or decrease each time unit. Once the desired time has been set, press the Save button.

Time Constant

Like in Manual Mode, the Time Constant can be changed in Log Mode. Follow the same procedures as in Manual Mode.

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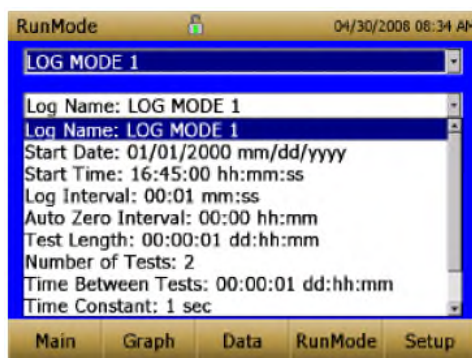
Use Start Date

The Use Start Date option allows the operator to toggle between using a programmed start date or not. To toggle between the options, press the up/down arrow to select the desired option and press Save.

Use Start Time

The Use Start Time option allows the operator to toggle between using a programmed start time or not. To toggle between the options, press the up/down arrow to select the desired option and press Save.

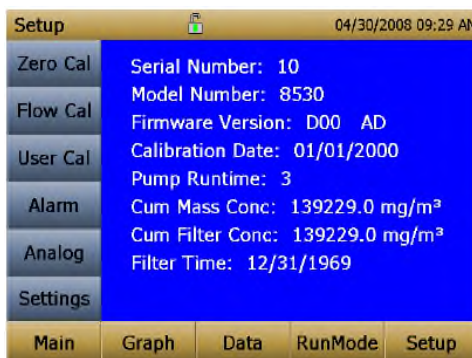
Log Mode Screenshot



2.3.2.3 Setup Button

When the Setup Button is pressed, a screen will appear that shows information regarding the serial and model number of the unit, the firmware version, the calibration date, the pump runtime, cumulative mass concentration, the cumulative filter concentration, and the date the filter was installed. On the left side of the screen, there are buttons for conducting a zero calibration, conducting a flow calibration, conducting a user calibration, setting the alarms, setting the analog out port, and changing miscellaneous settings.

Setup Menu Screenshot



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2.3.2.3.1 Zero Cal.

The DustTrak DRX should be Zero Calibrated prior to every use. Zero Calibration requires that a zero filter be attached prior to running. Zero Calibration must also be performed if the unit is reading negative concentrations. It is not possible for the unit to read negative concentrations, so negative concentrations should be viewed as a symptom of negative drift.

Note: Since the EPA DustTrak DRX units are equipped with Auto Zero Modules, it is recommended that the unit be run in Log Mode with the Auto Zero Function enabled, so the unit will automatically zero itself throughout an air monitoring event.

2.3.2.3.2 Flow Cal.

In the Flow Calibration menu, the operator has the ability to change and check the flow rate. In order to change the flow rate, press the up/down arrows to increase or decrease the flow rate. The DustTrak DRX is factory calibrated to pump at 3 liters per minute (L/min). The flow rate is divided to 2 L/min of the total flow being used to measure the aerosol flow and 1 L/min of the total flow is split off, filtered, and used for sheath flow.

In order to check the flow rate:

1. Attach a flow calibrator (Dry Cal) to the inlet port. In order to do this on the EPA DustTrak DRX units, the black hose connecting the Heated Inlet Sample Conditioner to the Water Trap must be disconnected to from the Water Trap and connected to the flow calibrator.
2. Move the up/down arrows to achieve the desired flow on the flow calibrator.
3. Select Save once the desired flow rate is achieved. Select Undo to return to the factory set point.

Flow Calibration Screenshot



2.3.2.3.3 User Cal.

The User Calibration menu allows the operator to store and use ten different calibration factors. In addition, there are two factory calibration default settings, one is the "Ambient Calibration" and the other is "Factory Calibration". The "Ambient Calibration" is appropriate for outdoor ambient dust or fugitive dust monitoring. The "Factory Calibration" is the calibration to ISO 12103-1, A1 Arizona test dust. The "Factory Calibration" is appropriate for most workplace aerosol monitoring. The active user calibration is marked with an asterisk.

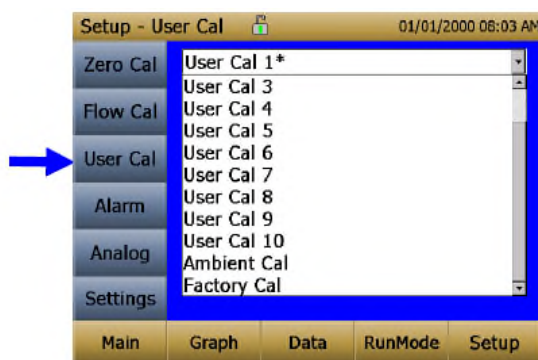
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Note: Due to the EPA DustTrak DRX units primarily being used for ambient dust and fugitive dust monitoring, the unit should be set to the “Ambient Calibration”.

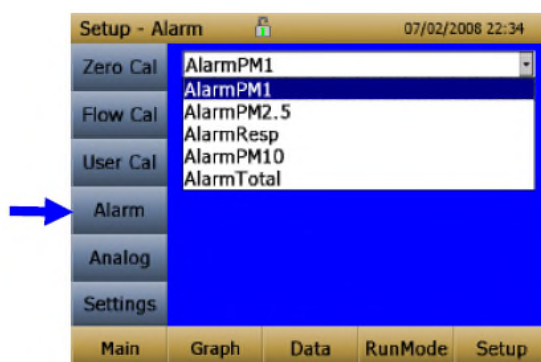
User Calibration Screenshot



2.3.2.3.4 Alarm

The Alarm menu allows the operator to change the alarm levels for each of the five mass channels (PM 1, PM 2.5, Respirable, PM 10 and Total). The alarm functioning is determined by the logging interval, which means that the alarm will only trigger when the average concentration over the Logging Interval exceeds the set point. The alarm will not trigger for intermittent spikes above the set point. Also, if the Logging Interval is too long and the concentration exceeds the set point and stays at that level, the alarm will not trigger until the Logging Interval has finished. Likewise, the alarm will continue until a logging period finishes where the concentration has dropped below 5% of the set limit.

Alarm Menu Screenshot





In order to set the alarm limits:

1. Select the mass channel that you would like to change the alarm limits for by pressing the mass channel with a stylus or finger.
2. On the next screen, press “Alarm1 Setpoint [mg/m³]:”
3. Use the numeric keypad to enter in the desired alarm limit. Alarm limits will be determined in the Air Monitoring Plan for the site. Press the Save button to save the desired alarm limit. **Note:** If both, Alarms 1 and 2 are activated, Alarm 2 must be a lower concentration than Alarm 1.

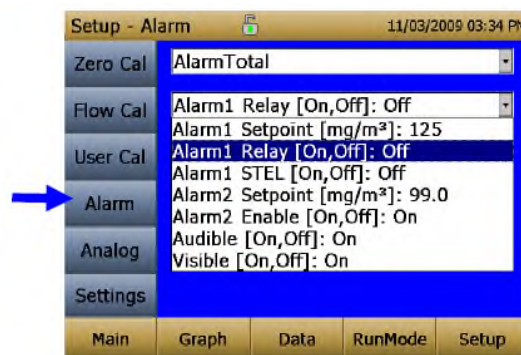
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4. Press "Alarm1 Relay [On/Off]:" to enter the relay alarm menu. When the relay alarm is turned on, the unit will close a relay switch when Alarm 1 is surpassed. The relay alarm can only be activated for one mass channel at a time.
5. Use the up/down arrows to toggle whether the relay alarm is turned on or off and press the Save button.
6. Press "Alarm1 STEL [On/Off]:" to enter the short-term exposure limit (STEL) alarm menu. When the STEL alarm is turned on, the unit will collect STEL data when Alarm 1 is triggered. The STEL alarm can only be activated for one mass channel at a time.
7. If a second alarm limit is necessary, press "Alarm2 Setpoint [mg/m³]:" to set the second alarm limit in the same way as Alarm 1. **Note:** If both, Alarms 1 and 2 are activated, Alarm 2 must be a lower concentration than Alarm 1.
8. If Alarm 2 is required, press "Alarm2 Enable [On, Off]:" to enter the Alarm 2 Enable menu.
9. Use the up/down arrows to toggle whether Alarm 2 is activated or not and press the Save button to save the selection.
10. If desired, the DustTrak DRX is equipped with an internal beeper that will sound when an alarm is triggered. To activate or deactivate the audible alarm, press "Audible [On, Off]:" to enter the audible alarm menu.
11. Use the up/down arrows to toggle whether the audible alarm is activated or not and press the Save button to save the selection.
12. As with the audible alarm, the DustTrak DRX will show an alarm icon ( for Alarm 1 and  for Alarm 2) that will appear in the Title Bar when an alarm is triggered. To activate the visual alarm, press "Visible [On, Off]" to enter the visible alarm menu.
13. Use the up/down arrows to toggle whether the visible alarm is activated or not and press the Save button to save the selection.

Alarm Setup Screenshot



2.3.2.3.5 Analog

The Analog menu is used to set up the parameters that will drive the analog out port.

Note: These settings are being developed by EPA and should not be altered. As a result, this section will not be discussed.

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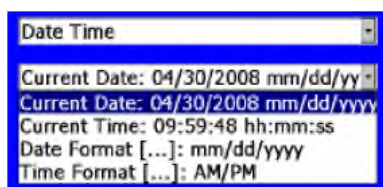
2.3.2.3.6 Settings

In the settings menu, the operator has the ability to change the time/date, the color of the background screen, calibrate the touch screen, view the USB internet protocol (IP) address, and change the language.

Date Time

Pressing "Date Time" in the Settings menu takes the operator to a menu where the time and date settings can be changed. It is ALWAYS important to make sure the time and date are correct on the unit. If the time and date are inaccurate, the data collected by the unit would not be legally defensible. To change any of the settings in the Date Time menu, press the item and use the up/down arrows to set to the desired value and press Save.

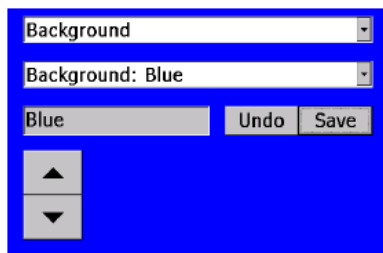
Date Time Menu Screenshot



Background

Pressing "Background" allows the operator to change the background color between blue and white. To change the color, press the up/down arrows to the desired color and press Save.

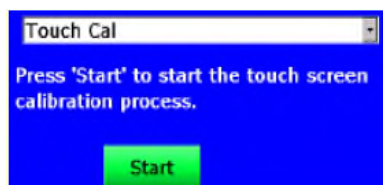
Background Menu Screenshot



Touch Cal.

Pressing "Touch Cal" allows the operator to calibrate the touchscreen. Touchscreen calibration should only be conducted if the screen becomes nonresponsive to touches. To calibrate the touchscreen, press the "Start" button and follow the on-screen directions.

Touch Cal. Menu Screenshot



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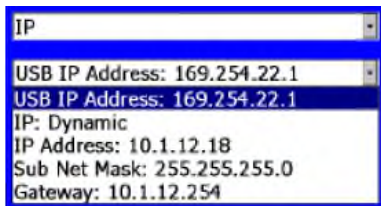
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IP

Pressing "IP" allows the operator to view and change the USB Port IP settings. The IP settings on the EPA DustTrak DRX units are being developed by EPA and should NOT be altered.

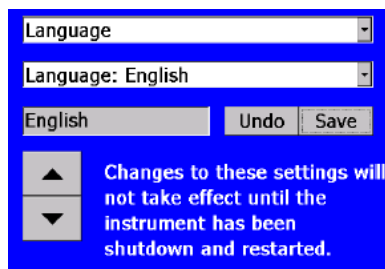
IP Menu Screenshot



Language

Pressing "Language" allows the operator to change the language the DustTrak DRX presents information in. The EPA DustTrak DRX units are set to English and should NOT be altered.

Language Menu Screenshot



2.4 Measurement

Once the settings on the DustTrak DRX unit has been set to their desired configurations, the unit is then ready to conduct an air monitoring event.

2.4.1 Starting an Air Monitoring Event

To start an air monitoring event, press the green "Start" button on the right side of the touch screen. During an air monitoring event, the main screen will show information regarding the mass fractions, the display mode, run mode, file name, test progress, and instrument errors.

Mass Fractions

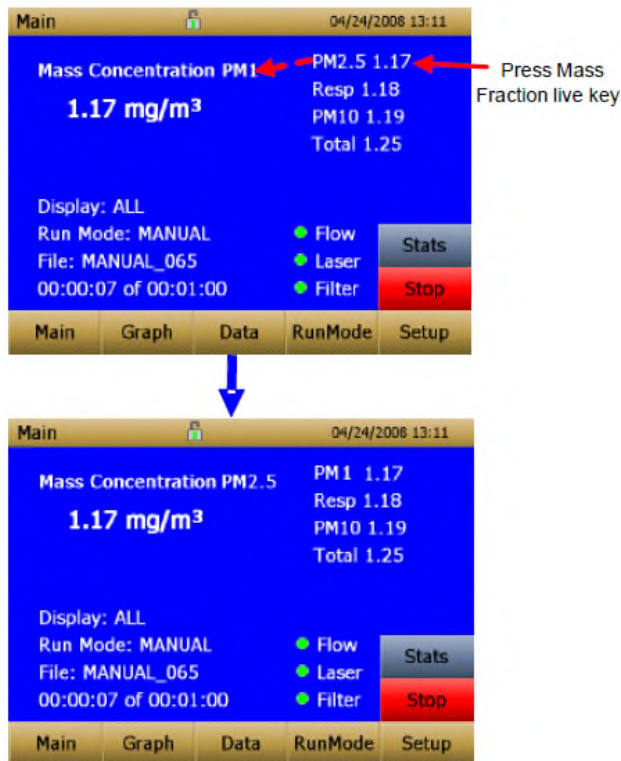
The mass fractions area of the main screen can be altered to view data for each of the five mass fractions. To change between which mass fraction is viewed on the left side of the screen, press the desired mass fraction in the list on the right side of the screen. The desired value will replace the former value and the former value will appear on the right side of the screen.

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Changing Particle Size Screenshots



Stats Button

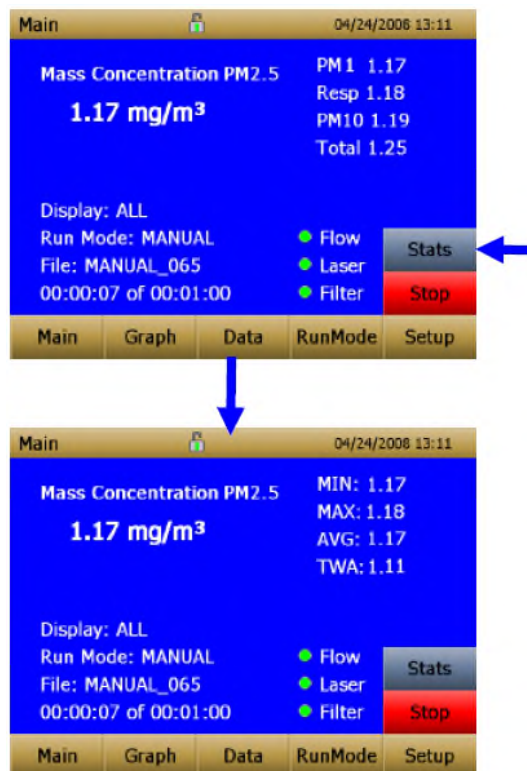
Pressing the “Stats” button will allow the operator to view the minimum concentration, maximum concentration, average concentration, and TWA concentration for the selected mass fraction. The concentration information specific to the mass fraction will replace the current concentrations for the other mass fractions on the right side of the screen.

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Stats Button Screenshots



Display

Pressing the “Display” portion of the Main Screen will allow the operator to change between displaying mass fractions associated with Environmental, Industrial Air Quality (IAQ-ENV), Industrial Hygiene (IH), and All mass fractions. The IAQ-ENV display will only show PM 1, PM 2.5, PM 10, and Total mass fractions. The IH display will only show Respirable (Resp), PM 10, and Total mass fractions.

Run Mode

The “Run Mode” portion of the Main Screen will display the mode that the unit is currently running in (Survey, Manual, or Log). The Run Mode cannot be altered during an air monitoring event.

File

The “File” portion of the Main Screen will display the file the data for the current air monitoring event is being stored to. The file name cannot be altered during an air monitoring event. **Note:** A file name will not appear while the unit is running in Survey Mode since the unit does not log data in Survey Mode.

Test Progress

The “Test Progress” portion of the Main Screen shows the amount of time that has elapsed during the current air monitoring event.

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Error Indicators

The "Error Indicators" portion of the Main Screen will show if the flow, laser, or filter are experiencing any failures. The EPA DustTrak DRX units are also equipped with alarms, so the STEL alarm indicator appears in the Error Indicator portion of the Main Screen. The dots next to the various indicators will appear green if the part is functioning properly and red if the part is having a failure. For the STEL alarm indicator, the dot will appear grey if there is no alarm and red if the unit is in alarm mode.

2.4.2 Stopping an Air Monitoring Event

Air monitoring events can be stopped in two ways. If the DustTrak DRX is operating in Log Mode or Manual Mode, the air monitoring unit will automatically stop at the end of the Test Length (see Sections 2.3.2.2.2 or 2.3.2.2.3). An air monitoring event can also be stopped manually in any mode. To stop an air monitoring event manually, press the red "Stop" button on the right side of the screen.

3 VIEWING AND DOWNLOADING DATA

Once the data has been logged for an air monitoring event, the data can then be viewed as a graph and as a summary. Data can also be downloaded to a USB thumb drive for processing.

3.1 Graph

The Graph Button will allow the operator to see the data in graphic form. In order to view a graph for data, the unit either must be currently air monitoring, or the operator must select data from a previous air monitoring event. If the unit is neither currently air monitoring, nor has data from a previous event selected, the graph will appear blank. When viewing a graph, the data displayed on the y-axis, the Time Display, and the Data Region can be altered by touching the different areas of the screen.

Graph Screenshot



Data Label

Pressing the Data Label allows the operator to change the type of data being displayed on the graph. The data will cycle through Total, PM 1, PM 2.5, Respirable (Resp.), and PM 10.

Scale Display

Pressing the Scale Display area allows the operator to change the scale of the y-axis. When the Scale Display area is pressed, an "Axis Settings" menu will pop up with the options available for changing the scale. In order to manually set the scale, the Auto Scale box must be unchecked. That will allow the operator to change the minimum and maximum scale by pressing the arrows next to the numbers.

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Axis Setting Menu Screenshot



Time Display

Pressing the Time Display area allows the operator to toggle between viewing the elapsed time since the first logged point [Time (s)], the actual time the data was collected [Time (abs)], and the relative time from zero the data was collected [Time (rel)].

Data Region

Pressing the Data Region area will bring up the Graph Config. Menu. This menu allows the operator to choose between displaying a time-weighted average (TWA) line through the graph and displaying the running average of the data. To turn on either of these average lines, check the box adjacent to the desired selection and press OK. To turn off the average line, uncheck the box adjacent to the average line and press OK.

Graph Config. Screenshot



3.2 Data Button

The Data Button will allow the operator to view the datalog for air monitoring events that are stored on the unit. From this screen, the operator also has the option of downloading datalog files, deleting datalog files, and scrolling through data summaries for the various datalog files.

Select File

Click on a particular Filename to select a file. The files are also listed by the Date and Time the data was collected, which should help with deciding which file to view.

Size Frac.

When the operator presses the Size Frac. button, the data summary section (lower, left side of screen) will cycle through the data summaries for the various particle sizes (Total, PM 1, PM 2.5, Respirable, and PM 10). The data summary section will display the minimum concentration, maximum concentration, average concentration, and TWA concentration.

Save All

Pressing the Save All button will download all the datalogs stored on the unit to a USB thumb drive. The thumb drive must be plugged into the USB Host Port. Data will be exported as a spreadsheet in a comma-separated values format (.csv).

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4 TROUBLESHOOTING

Symptom	Possible Causes	Corrective Action
Erratic zero reading	Leak	Check connections for leaks
	Dirty Inlet port and/or sample tube	Clean inlet port. Clean or replace tubing
	Internal filter(s) not installed properly (leaking)	Inspect internal filter wells to make certain the filters and o-rings are seated properly. Replace internal filters if necessary.
DustTrak reading negative concentrations	Zero Drift	Perform Zero Calibration.
	Zero Calibration was performed without the Zero Filter in-line	Perform Zero Calibration again and make sure the Zero Filter is attached to the DustTrak inlet.
Error completing Zero Calibration	Too much light scatter in the optics chamber due to dust deposits	<p>Clean the inlet nozzle. Attach the Zero Filter and sample for about 2 minutes. During sampling, pulse the flow going into the DustTrak monitor by intermittently plugging the Zero Filter. Any dust in the optics chamber will break loose during flow pulsations and will be cleared out by the pump.</p> <p>Perform Zero Calibration again. If the Zero Calibration still cannot be performed, factory service may be required.</p>
Run Mode Error: The start time has passed	The selected Run Mode program has "Use Start Date" selected, but the start date is prior to the current date	Correct or change the Run Mode program.
Run Mode Error: The selected log mode will exceed the allowed number of samples	The selected Run Mode program is programmed to save more samples than is available in the memory.	Reduce the number of samples by reducing the Test Length or increasing the Logging Interval
Instrument runs slow	Large amounts of data are stored in the memory	Large data files or many small data files will cause the instrument to run slow, due to the need to read and display large amounts of data.
No display	Unit not switched on	Switch unit on.

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Symptom	Possible Causes	Corrective Action
	Low or dead batteries	Recharge the batteries or plug in the AC adapter.
No touchscreen response	Instrument currently busy	The instrument will take time to open large data files and save configuration information. During this time, the instrument will not respond to additional touchscreen touches.
	Instrument touchscreen is locked	If the lock in the Title Bar is red, unlock the instrument following the instructions in Section 2.3.1.
Analog output does not work	Cable/connector not correctly installed	Make sure the cable connector is fully sealed.
	Output wired with reverse polarity	Make sure analog out (+) and analog ground (-) are wired correctly to data-logger.
Analog output is not in proportion to display	Analog output range in DustTrak monitor may be set incorrectly	Check the analog output setting in the Setup->Analog screen. Make sure the channel of interest is selected. Make sure the correct output (0 to 5V, 4 to 20 mA) is selected.
	Data logger scaling factor may be set incorrectly	Review the scaling factor set in the Setup->Analog screen.
Alarm output does not work	Alarm function not turned on	Turn the alarm function on in the Settings->Alarm screen.
Alarm does not turn on correctly	Alarm setting incorrect	Check the alarm settings in the Settings->Alarms screen Make sure the Logging Interval and Time Constant are set as short as possible (30 seconds or lower).
	Alarm output wired with reverse polarity	Alarm wires are polarized. Voltage input must be wired to alarm input (+).
Instrument does not store new data	Memory is full	Delete or transfer historic data.
	Instrument is in Survey Mode	The instrument does not store data in Survey Mode. Change to Manual or Log Mode.

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Symptom	Possible Causes	Corrective Action
Flow Error is indicated on the Main Screen	If sampling from a duct, instrument may have problems overcoming pressure differences	Attach both the input and the exhaust port into the duct.
	Flow obstruction	Remove the obstruction in still present. Press any key to bypass.
	Internal pump failing, indicated by inability to adjust flow rate to full range	Factory service is required.
	Filter Cassette clogged or has mass loading	Replace the filter cassette.
	External pump module is not connected to the DustTrak monitor	<p>Make sure both the External Pump cable and the flow tubing connector are connected to the DustTrak monitor and the External pump module. Lock the External Pump Cable in place by rotating the connector clockwise until you hear it snap in place.</p> <p>Make sure the tubing between the DustTrak monitor and the External Pump Module is not kinked and is free of any sharp bends.</p> <p>Make sure the exhaust adapter is connected to the exhaust of the DustTrak monitor.</p> <p>Make sure the External Pump Module filters are not clogged. If found dirty, replace the two HEPA filters.</p>
Laser Error indicated on the Main Screen	Laser background is too high	Remove and clean the inlet nozzle. Pay close attention to the tip of the nozzle that is inserted into the instrument to ensure it is clear of any contamination.
	Laser is failing	Factory service is required.
Filter Error indicated on the Main Screen	Filters need to be replaced	<p>Replace the filters.</p> <p>Note: This is only a warning. The unit will continue to operate normally until the increase in pressure drop across the filter is so</p>

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Symptom	Possible Causes	Corrective Action
		high that the pump can no longer maintain the set flow rate.
System Error Has Occurred!	The processor did not receive the input it expected. This can also happen if the optics chamber is saturated with light, or if the External Pump cable is accidentally disconnected during the middle of sampling.	Reboot the instrument. If the error does not go away, factory service is required.