

Standard Operation Procedures for Discrete PM2.5 and PM10 Using the Partisol 2025B

In Use By

**Polk County Air Quality
Ambient Air Monitoring Personnel
For Calendar Year 2018**

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POLK COUNTY AIR QUALITY DIVISION

STANDARD OPERATING PROCEDURE MANUAL FOR RUPPRECTH & PATASHNICK 2025 MONITORING

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5.0 STANDARD OPERATING PROCEDURE FOR DISCRETE PM2.5 and PM10 MONITORING USING THE THERMO SCIENTIFIC 2025 SEQUENTIAL AIR SAMPLER

5.1 Purpose

To establish a standard operating procedure (SOP) for Polk County Ambient Air Quality personnel to ensure proper set-up and installation of the Thermo Scientific Model 2025 Sequential Air Sampler.

5.2 Scope

These procedures are to be used by Polk County Air Quality Division personnel. The objective of this SOP is to familiarize the station operator with procedures used in the collection of air monitoring data. The accuracy of data obtained from any instrument depends upon the instrument's performance and the operator's skill. It is important that the station operator become familiar with both this SOP as well as the manufacturer's instruction manual in order to achieve a high level of data quality. This SOP is to be used as an outline and is not intended to replace the equipment manufacturer's manual or procedures.

5.3 References

- 5.3.1 Partisol®-Plus Model 2025 Operating Manual Sequential Air Sampler Revision B, Thermo Scientific, November, 2006.**
- 5.3.2 Partisol®-Plus Model 2025 Service Manual Model 2025 Sequential Air Sampler Revision B, Thermo Scientific, May, 2004.**
- 5.3.3 Partisol®-Plus Model 2025 PM-2.5 Air Sampler Quick Start Guide. Thermo Scientific, Revision A.004, October 9, 2008.**
- 5.3.4 Partisol®-Plus Model 2025 PM-10 Air Sampler Quick Start Guide. Thermo Scientific, Revision A.001, October 9, 2008.**
- 5.3.5 Test and Acceptance Guide, Partisol-Plus Model 2025 Sequential Air Sampler Revision A, Rupprecht & Patashnick Co., June 1998.**
- 5.3.6 40 Code of Federal Regulations (CFR) Part 50, Appendix L, Reference Method for the Determination of Particulate Matter as PM2.5 in the Atmosphere.**
- 5.3.7 40 Code of Federal Regulations (CFR) Part 50, Appendix M, Reference Method for the Determination of Particulate Matter as PM10 in the Atmosphere.**
- 5.3.8 40 Code of Federal Regulations (CFR) Part 58, Appendix A, Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS).**
- 5.3.9 Quality Assurance Guidance Document 2.12, Monitoring PM2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods, USEPA, Nov. 1998 (<http://www.epa.gov/ttn/amtic/pmgainf.html>).**
- 5.3.10 PM2.5 Mass Validation Criteria, March 30, 1999. (<http://www.epa.gov/ttn/amtic/pmgainf.html>).**
- 5.3.11 Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Appendix D, March 2017.**

5.4 Introduction

This document describes the procedures used to sample PM2.5 and PM10 particulate matter by the Polk County Air Quality Program. PM2.5 has an aerodynamic diameter of 2.5 micrometers or less, while PM10 has an aerodynamic diameter of 10 micrometers or less.

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For PM2.5 sampling, a Partisol®-Plus Model 2025 Sequential Air Sampler draws a known volume of ambient air at a constant flow rate through a PM10 size-selective inlet followed by a Very Sharp Cut Cyclone (VSCC) particle size separator. Figure 5-1 displays the VSCC which removes particles in the 2.5 to 10 micrometer range. Particles in the PM2.5 size range are then collected on a Teflon® filter during a specified 24-hour sampling period. Each sample filter is weighed before and after sampling to determine the net weight (mass) gain of the collected PM2.5 sample. This mass concentration is reported as micrograms per cubic meter at local conditions. The reference method for PM2.5 sampling is given in the Code of Federal Regulations (40 CFR 50, Appendix L). This document is intended to be used together with the sampler-specific information and instructions provided by the manufacturer of the PM2.5 sampler in the sampler's operation or instruction manual.

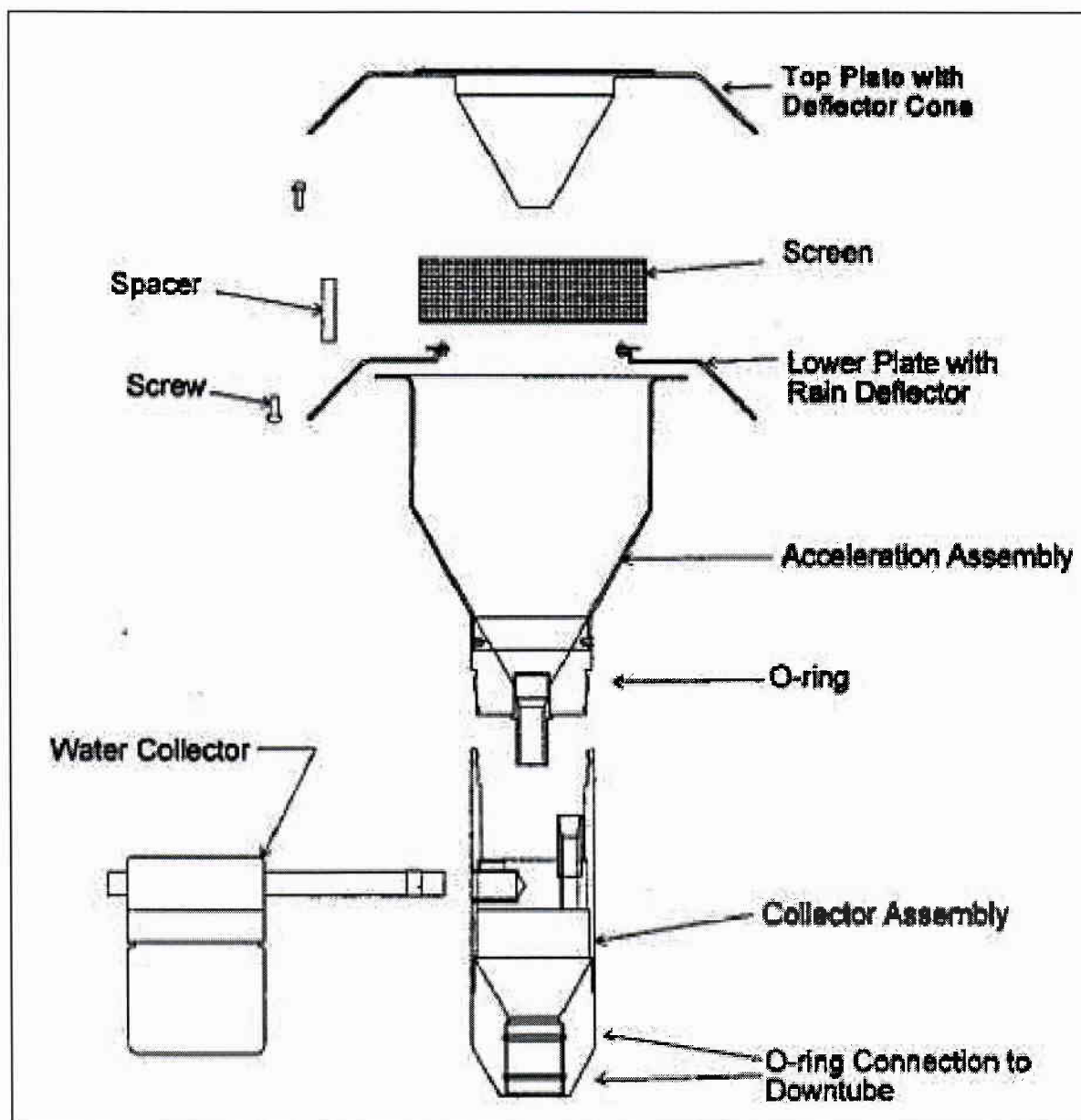
For PM10 sampling, a Partisol®-Plus Model 2025 Sequential Air Sampler can also be used. The Very Sharp Cut Cyclone is removed and replaced with a pass through adapter tube. Particles in the PM10 size range are then collected on a Teflon® filter during a specified 24-hour sampling period. Each sample filter is weighed before and after sampling to determine the net weight (mass) gain of the collected PM10 sample. This mass concentration is reported as micrograms per cubic meter at standard conditions (25°C and 760 mmHg). The two different configurations of Set Temp/Flow Screens are shown later in this SOP to reflect the difference between reporting PM2.5 at local conditions and PM10 at EPA standard conditions (Section 5.6.2.2). The reference method for PM10 sampling is given in the Code of Federal Regulations (40 CFR 50, Appendix M).

Figure 5-2 is a schematic drawing showing the inlet head of the PM2.5 and PM10 samplers. The inlet is designed to remove particles with aerodynamic diameter greater than 10 µm and to send the remaining smaller particles to the next stage. The design flow rate through the inlet is 16.7 liters per minute.

Figure 5-1: Very Sharp Cut Cyclone (VSCC) Used for PM2.5 Sampling



Figure 5-2: Exploded Cross-Sectional View of Inlet Head Common to Both PM2.5 and PM10 Samplers



5.5 Sampler Set-Up

5.5.1 Inspecting New Equipment

When shipment of the sampler is received, verify that the package contents are complete as ordered. Inspect the instrument for external physical damage due to shipping, such as scratched or dented panel surfaces and broken knobs or connectors.

Remove the instrument cover and all interior foam packing and save (in case future shipments of the instrumentation are needed). Make note of how the foam packing was installed.

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Inspect the interior of the instrument for damage, such as broken components or loose circuit boards. Make sure that all of the circuit boards are completely secured. (Loose boards could short out the motherboard). If no damage is evident, the monitor is ready for calibration, installation and operation. If any damage due to shipping is observed contact Thermo Scientific at 1-866-282-0430 for instructions on how to proceed.

If you discover that the instrument was damaged during shipping and it becomes necessary to return it to the manufacturer, repack it in the same way it was delivered.

5.5.2 Setup of New Equipment

The sampler should arrive in two parcels. A large rectangular box contains the sampler and its accessories. A cylindrical tube contains the stand. A flat blade screwdriver, a #2 Phillips screw driver and a 7/16" wrench are necessary for assembly. Materials needed for other aspects of the setup are listed in the relevant SOP document.

Begin a logbook or logbook section for the sampler.

Unpack the sampler and check the components against the list above and the packing list enclosed with the sampler. Record the sampler serial number in the logbook.

Cut any tie wraps and remove any transport restraints from inside the sampler enclosure. Assemble the Partisol® Stand and mount the sampler enclosure on the stand with the hardware provided.

Install the large rain hood on the right side of the enclosure. The rain hood should cover both air filters:

- Peel back the paper facing of the larger gasket and apply it to the larger rain hood.
- Place the large rain hood with its gasket attached on the enclosure.
- Secure the rain hood to the unit using four (4) #10-32 x 1/2" slot bind head screws.
- Install the two small rain hoods. Both rain hoods are installed on the back panel of the enclosure.
- Peel back the paper facing of one of the smaller gaskets and apply it to one of the smaller rain hoods.
- Place the small rain hood with its gasket attached on the enclosure.
- Secure the rain hood to the unit using four (4) #10-32 x 1/2" slot bind head screws.
- Repeat this procedure for the other small rain hood.

Install the sample tube and 1st stage inlet:

- Insert the end of the sampler tube with the 5cm (2 inch) machined section into the bulkhead of the sampler. Ensure that the tube is pushed into the enclosure through the final O-ring unit it hits a stop.
- Turn the dome connector on the bulkhead to ensure a tight grip.
- Place the 1st stage inlet on the end with 3 cm (1.25 inch) of machining. Ensure that the tube is pushed past the inlet's two O-rings, which provide some resistance, and hits a stop.

Install the ambient temperature sensor:

- Locate the two screws installed on the left side of the enclosure.
- Remove the two screws, being careful not to lose the washers. This will expose two holes.
- Locate the ambient temperature probe assembly in the compilation package.
- Place the ambient temperature probe assembly over the two holes in the left side of the sampler enclosure.
- Secure the assembly to the enclosure using the screws and washers previously removed. Place the washers between the ambient temperature bracket and the enclosure (not under the head of the screw) to prevent leakage of water into the electronics compartment.
- Plug the ambient temperature probe into the connector on the back panel of the sampler labeled "Ambient Temperature".

Loading and installing a cassette magazine:

- Load the supply magazine with assembled filter cassettes, so that the filters are facing the open end of the supply magazine.
- Install the loaded supply magazine (air connection facing the operator) in the left side of the sampler.
- Attach the air pressure supply tube at the base of the supply cassette magazine.
- Install the empty supply magazine in the right side of the sampler.
- Connect the unit to the electric supply.

For more detailed information concerning setup of the 2025, refer to Partisol®-Plus model 2025 PM-2.5 Air Sampler Quick Start Guide and Partisol®-Plus model 2025 PM-10 Air Sampler Quick Start Guide.

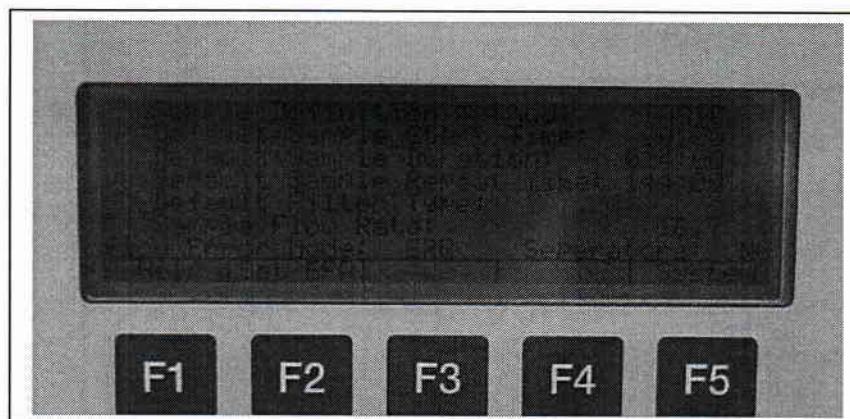
5.5.3 Programming the Sampler

5.5.3.1 Program Setup Screen

Figure 5-3 displays the Setup Screen. From the home screen, press <F5:Setup>. The defaults are set as follows:

Sample Definition Method:	BASIC
Sample Start Time:	00:00
Sample Duration:	024:00
Sample Repeat Time:	024:00 (daily sampling) 072:00 (1 in 3 sampling) 144:00 (1 in 6 sampling)
Filter Type	<BLANK>
Sample Flow Rate	16.7
Flow Error Mode:	ERR
Separators:	No

Figure 5-3: Setup Screen



5.5.3.2 Program System Setup Screen

On the Setup screen as shown in Figure 5-3 above, press <F5:System> to enter the system set-up screen. Figure 5-4 shows the System Setup Screen. Confirm the sampler is set to the correct time and date. If not, press <EDIT> and enter the correct date, and press <ENTER>.

For PM2.5, the monitor must be programmed to sample in local temperature and pressure. These are the default settings for the 2025 sampler. Ensure that each line is as follows:

Average Temp:	99 (*local conditions)	Standard Temp:	99
Average Pres:	999 (*local conditions)	Standard Pres:	999
Date Form:	yy/mm/dd	Average Time:	30
Time Form:	:	Filter Fan:	Auto
Current Time:	(set to current time)	Auto Run:	YES
Current Date:	(set to current date)		

For PM10, the monitor must be programmed to sample in standard temperature and pressure. Press <EDIT> and enter a standard temperature of 25 and a standard pressure of 760, and press <ENTER>. Ensure the each line is as follows:

Average Temp:	99 (*local conditions)	Standard Temp:	25
Average Pres:	999 (*local conditions)	Standard Pres:	760
Date Form:	yy/mm/dd	Average Time:	30
Time Form:	:	Filter Fan:	Auto
Current Time:	(set to current time)	Auto Run:	YES
Current Date:	(set to current date)		

Figure 5-4: System Setup Screen

System Setup					
Average Temp: 99		Standard Temp: 99			
Average Pres: 999		Standard Pres: 999			
Date Form: YY/MM/DD		Average Time: 30			
Time Form: :		Filter Fan: ON			
Curr Time: 05:00:00		Auto Run: ON			
Curr Date: 98/04/10					
Help	I/O	Site ID	Passwd	SysInfo	
Function Keys in Browse Mode					
Help	I/O	Site ID	Passwd	SysInfo	
Function Keys in Edit Mode					
-List	+List	Eksp	ChSign		

5.5.3.3 Program Site IDs

Confirm that the site ID is correct by pressing <F3:SiteID>, edit and enter the ID if necessary. ID1 will identify the sample location. It should be a continuous 9-digit AIRS code of state (19), county (153) and 4-digit site code (i.e. 191530030). ID2 will identify the monitor in use. It should be a 5-digit serial number unique to that monitor followed by the pollutant being sampled (i.e. 12345 PM10). Press <ESC> to return to the main menu. The sampler is now configured to perform sampling activities.

5.6 Standards

5.6.1 Transfer Standards

Transfer standards are used to calibrate the station "field" samplers and to perform verifications. Instruments designated as transfer standards are used so the primary standard can remain at a fixed laboratory location where conditions can be carefully controlled and damage to the instrument minimized. Transfer standards are calibrated against the higher-level, primary standards. All transfer standards must be accompanied by the following:

- The manufacturer's manuals for the instruments
- A logbook including a complete chronological record of all certification and recertification data as well as all PM2.5 and PM10 sampler calibrations carried out with the transfer standard
- A complete listing and description of all equipment, materials, and supplies necessary or incidental to the use of the transfer standard
- A complete and detailed operational procedure for using the transfer standard, including all operational steps, specifications and quality control checks