



Sulfate

MEASUREMENT AND ANALYSIS OF AMBIENT AEROSOL SULFATE CONCENTRATIONS USING R&P SERIES 8400S

1. PURPOSE AND APPLICABILITY

This research protocol contains the protocol for measurement and analysis of sulfate concentrations in ambient aerosol particles at the Baltimore PM supersite using the Rupprecht and Patashnick Series 8400S ambient sulfate particulate monitor. This is an evaluation version of an anticipated standard operating procedure (SOP), which will result from experiences with this RP. Due to this nature this RP is subject to changes. Every addition to this RP will be added as an Appendix during this study.

NOTE: AS OF January 3, 2001 THERE IS NO MANUAL AND NO INSTRUMENT AVAILABLE . WE ANTICIPATE THAT THE OPERATION OF THE SULFATE MONITOR WILL RESSEMBLE THE PROCEDURES FOR THE NITRATE MONITOR. THERE WILL BE MAJOR CHANGES UPON DELIVERY OF THE SULFATE MONITOR AND MANUAL.

2. DEFINITIONS

1. QUALITY ASSURANCE

The objective for the Automated Particle Sulfate measurements is to determine the concentration of fine particle sulfate, sulfate and carbon in ambient air with a time resolution of at least 15 minutes. Quality assurance objectives for the sulfate systems are as follow:

- Accuracy:* Average of sulfate concentrations should agree to within 25% of denuded nylon filter values from the sequential sampler at the same site.
- Precision:* at least $\pm 10\%$ (= 1 sigma) as determined by replicate standards.
- Lower Quantifiable Limit:* $1 \mu\text{g}/\text{m}^3$ for a 10 min sample.
- Completeness:* At least 88% data completeness.

The components to achieving these objectives are:

1. Written standard operating procedure (this SOP);
2. Verification of installation
3. Careful operator training



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4. Daily and weekly system checks as outlined in the SOP,
5. Routine collection of dynamic blanks
6. Routine calibrations,
7. Routine data review and
8. On-site audits.

4. HEALTH AND SAFETY WARNINGS

1. Pressurized air is used to for calibration and operation. Observe safety precautions for pressurized non-flammable gases.

5. CAUTIONS

N/A

6. INTERFERENCES

N/A

7. RESPONSIBILITIES

N/A

8. EQUIPMENT AND MATERIALS

8.1 Equipment

1. R&P Series 8400S Sulfate Monitor
2. Personal computer
3. N₂ for calibration (one canister attached, spare canister on site)
4. NO₂ in N₂ for calibration
5. Spare flash strips
6. Standard bubble flow meter (Giliberator)

8.2 Paper materials

1. Field forms to record performance in the field
2. Laboratory book Sulfate monitor

9. PROCEDURES



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This section explains how to program a sampling run, retrieve data after a sampling run in the field and verify your monitor's performance characteristics.

9.1. Programming the Monitor

This section describes the procedures for programming the Sulfate Monitor for a sampling run.

- 1) Ensure that the Pulse Generator is turned on, displaying the READY Mode, and that it is not showing any status codes.

Mode: READY		8400 Nitrate Monitor		Status: OK	
Start Time: 12:00:00		H2O Reservoir: OK		Flash Strip: OK	
Time Left: 0 sec		Current Step: -----			
NOx Pulse Analyzer: 9.3 ppb		Sample Flow: 1.12 l/min		Cross Flow: 0.00 l/min	
Analyzer Flow: 0.83 l/min		Cell Compartment Temp: 21.2 C		Cell Pressure: 0.993 atm	
Ambient Temp: 20.7 C		Ambient Pressure: 0.993 atm			
Nitrate Conc: 30.2 ug/m3				2000-Jun-14 14:03:21	
Status Codes	Current Stats		Data	Cycle Setup	System Setup

- 2) Ensure that the Pulse Analyzer is turned on, displaying the SAMPLE Mode and that it is not showing any error messages.



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SAMPLE	RANGE= 10000.00 PPB	NOX= -8.7
<TST TST> CAL		SETUP

- If this is the first time that you are starting your Sulfate Monitor, go to step 4. If this is not the first time that you are starting your Sulfate Monitor (routine startup), go to step 6.
- While in the Pulse Generator's Main screen, press <F6: System Setup> to display the System Setup screen.

Mode: READY		System Setup		Status: OK	
Ave Temp: 99.9 C		Year: 2000			
Std Temp: 99.9 C		Month: June			
Ave Pres: 999 mbar		Day: 10			
Std Pres: 999 mbar		Hour: 12			
		Minute: 32			
		Second: 00			
Ambient Temp Sensor Installed: YES				System Info	
			EDIT	2000-Jun-14 15:47:16	
RS232 Setup		Setup Analog Outputs	Contact Closures		8400 Setup

- While in the System Setup screen, press <EDIT>. Enter the current date and time and then press <ENTER> to save these changes. Then press <ESC> to return to the Main screen.



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6) While in the Pulse Generator 's Main screen, press <F5: Cycle Setup>to display the Cycle Setup screen .

Mode: READY	Cycle Setup	Status: OK
Sample Time: <input type="text" value="515"/> sec Purge Time: 30 sec Baseline Read Time: 10 sec Read 1 Time: 20 sec Read 2 Time: 1 sec (0 = disable)		
Base Start Time: 00:10 Minimum Cycle Length: 598 sec Desired Cycle Length: 600 sec (0 = no delay) Number of cycles: 0 cycles (0 = continuous)		
Perform flow audit: 6 cycles (0 = disable) Start analyzer audit: 04:00 Perform analyzer audit: 1 days (0 = disable)		
		EDIT
		2000-Jun-14 22:14:05
		Audit Setup
		8400 Setup

7) While in the Cycle Setup screen, press <EDIT>. Enter the sample time, purge time, baseline read time, read 1 time, read 2 time, base start time, desired cycle length, number of cycles, and the start analyzer audit and perform analyzer audit times.

Press <ENTER>to save these changes, then press <ESC>to return to the Main screen.

8) Press <RUN/STOP>.The monitor will begin to run (if you entered "IMMED" in the Base Start Time field) or it will enter the WAIT Mode and then begin its cycle at the programmed start time.

10 Instrument maintenance

10.1 Every other day maintenance

1. Check status screen of the monitor and verify that no alarms or warnings are present
2. Check status display of pulse analyzer for warnings
3. Check data file for completeness



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4. Check computer and monitor time and date for accuracy

5. Check N₂ canister pressure. Order new N₂ canister if current canister is less than 50% full.
6. Check gauge readings
7. Check H₂O reservoir
8. Check Rcell pressure
9. Check display for Flash strip ok

10.2 Weekly maintenance

1. Check sample flow rate with Gilibrator. Record sample flow in the lab book
2. Check sample inlet for pollution or clogging
3. Perform analyzer audit according to section 11-8 of the manual

10.3 Maintenance every 3rd week

1. Perform aqueous standard procedures according to manual 11-9

10.4 Maintenance every 6th week

1. Perform leak check according to manual 11-10