

Wisconsin State Laboratory of Hygiene
NADP Program Office
Revision date: 12/4/2019

NADP AMNet Standard Operating Procedure Site Report D: Annual/As Needed Maintenance



National Atmospheric Deposition Program

Wisconsin State Laboratory of Hygiene

NADP Program Office

Revision date: 12/4/2019

For information about the National Atmospheric Deposition Program (NADP) contact:

NADP Program Office

Wisconsin State Laboratory of Hygiene

465 Henry Mall

Madison, Wisconsin 53706

URL: <http://nadp.slh.wisc.edu>

e-mail: nadp@slh.wisc.edu

phone: 608-263-9162

Abbreviations

AIRMoN	Atmospheric Integrated Research Monitoring Network
AMNet	Atmospheric Mercury Network
AMoN	Ammonia Monitoring Network
CAMD	Clean Air Markets Division
CAMNET	Canadian Atmospheric Mercury Network
CASTNET	Clean Air Status and Trends Network
CVAFS	Cold Vapor Atomic Fluorescence Spectroscopy
DFU	Dry Filter Unit
DQO	Data Quality Objectives
GEM	Gaseous Elemental Mercury (expressed in ng/m ³)
GOM	Gaseous Oxidized Mercury (expressed in pg/m ³)
Hg	Mercury, the element (“hydrargyrum”)
LPM	Liters per Minute
LST	Local Standard Time
MDE	Mercury Deposition Event
MDN	Mercury Deposition Network
MSDS	Material Safety and Data Sheets
NADP	National Atmospheric Deposition Program
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NOS	Network Operations Subcommittee
NTN	National Trends Network
OSHA	Office Safety and Health Administration
PBM _{2.5}	Particle-Bound Mercury less than 2.5 µm in diameter (expressed in pg/m ³)
PO	NADP Program Office
QA	Quality Assurance
QAAG	Quality Assurance Advisory Group
QC	Quality Control
QR	Quality Rating
RF	Response Factor
RGM	Reactive Gaseous Mercury
RPF	Regenerable Particulate Filter
SOP	Standard Operating Procedure
SQL	Structured Query Language
TGM	Total Gaseous Mercury
UHP	Ultra High Purity
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WSLH	Wisconsin State Laboratory of Hygiene

Introduction

Maintenance activities are required annually for each site in the NADP Atmospheric Mercury Network (AMNet). Near the end of each calendar year, the operator should complete the maintenance activities described in this Standard Operating Procedure (SOP) document, *Site Report D: Annual/As Needed Maintenance*. Depending on conditions at the site (e.g., relative humidity, line voltage), some maintenance activities may be required more frequently. In such instances, the maintenance activities should be completed on an “as needed” basis.

The activities described in this SOP exam the ambient mercury monitoring system, and ensure that the instrument is free from typical mechanical and operational faults. The SOP and its associated report identify the components that require maintenance, the consumables required as part of the maintenance, and the tools necessary to perform the maintenance. A copy of the annual/as-needed maintenance report is included in the Appendix to this document. The activities associated with the annual/as-needed maintenance require no in-lab preparation. The Report requires confirmation that specific tasks were completed, and the reporting of specific measurements. An “X” in the **Done** column indicates the task was performed. The date and time of the period impacted by each task should be indicated in the report. Users are encouraged to use the electronic version of the Report

The completed report should be named using the naming scheme *RSSSSYYYYMM.xls*, where R is the report type (e.g., A, B, C, or D – refer to title of the corresponding SOP), SSSS is the 4-character site ID, YYYY is the 4-digit year, and MM is the 2-digit designation for the month. For example, DVT99200912.xls is the annual/as-needed maintenance report that was completed in December 2009 for VT99. A copy of the report should be submitted to the NADP Program Office upon completion of the maintenance activities. The information contained in the report, and in all other reports, is used when validating the data. It is important that all reports are submitted in a timely manner.

This SOP is not intended to be a troubleshooting guide. Additional information is available in the user manuals for the instrumentation, the instrument Technical Notes, and from the AMNet site liaison.

Field Activities

Table 1. Annual/As-Needed Equipment Maintenance, Field Activities.

Maintenance required	Reset or replace 2537 lamp Install new matched pair of gold cartridges Clean or replace 2537 Teflon valves Clean or replace cuvette Service or repair the 2537 pump
Consumables required	New UV lamp 2537 pump brushes and diaphragm New matched pair of gold cartridges 2537 V2 and V3 valves Reagent grade water Laboratory grade methanol
Tools required	Clean, non-talc gloves Adjustable wrench Flat-head screwdriver Phillips screwdriver Pliers Allen wrenches

Completing the Report

Site, Block 1 - Enter the site name and the site ID. Site names are chosen during the site selection and installation process. The site ID is a four-character code that is assigned by the NADP Program Office.

1. Site	
Name:	ID:

Operator, Block 2 - Enter the name and initials of the person that performed the maintenance, and to whom questions should be directed if there are questions about the report. Three initials should be used, if possible.

2. Operator	
Name:	Initials:

Date, Block 3 - Enter the date the maintenance was performed, or the date the maintenance was started if maintenance extends multiple days. Enter the date in the form YYYY/MM/DD, where YYYY is the 4-digit year, MM is the numeric designation for the month, and DD is the day of the month.

3. Date (YYYY/MM/DD)

Service Options Checklist, Block 4 - Tasks listed at the top of the Report require confirmation that specific tasks were completed. Tasks listed at the bottom of the Report require the reporting of measured values. When a component is replaced, the serial number of the new component should be recorded.

4. Service Options Checklist							
	Task	Done	Period Impacted (local time, 24 hr)				Comments, Actions
		X	MM/DD	13:50	MM/DD	15:15	
D01	2537 lamp changed						
D02	Gold cartridges changed -- New serial number						
D03	2537 teflon valves cleaned						
D04	2537 teflon valves replaced						
D05	2537 cuvette cleaned						
D06	2537 cuvette replaced						
D07	2537 pump serviced						
D08	1130 Heated boot replaced						
D09	1130 case heater replaced						
D10	1135 case heater replaced						
D11	Heated sample line rinsed						
D12	Independent survey performed						
	Task	Value	Period Impacted (local time, 24 hr)				Comments, Actions
			MM/DD	13:50	MM/DD	15:15	
D13	Swap 2537A -- New Serial Number						
D14	Swap 2537A -- New Cal Hg amount (pg)						
D15	Swap 1130 Pump Module - New Serial Number						
D16	Swap 1130 Sampling Head - New Serial Number						
D17	Swap 1135 Sampling Head - New Serial Number						

2537 Lamp Adjusted or Changed - If lamp voltage exceeds 12.5V, the lamp indicator light on the 2537 front panel will illuminate. Adjust lamp voltage according to Tekran user manual and Tech Note TN 2537-13 *Lamp Driver Modification Kit Installation*. If you are unable to adjust the lamp and achieve satisfactory operating condition, replace the lamp according to the Tekran user manual and Tech Note TN 2537-13.

Gold Cartridges Changed - If either the SPAN or ambient GEM values deviate by more than 15% between the A and B cartridges, the gold cartridges may need to be replaced. Refer to Tekran 2537 user manual for proper gold cartridge replacement procedure. Starting in 2009 Tekran identifies the gold cartridges with serial numbers. Record the serial numbers of the new gold cartridge on the form.

2537 Teflon Valves Cleaned – If channel specific cartridge differences are observed, valves V2 and V3 valves may need to be cleaned. Remove valves and back flush with reagent grade water and methanol. Dry, replace and retest.

2537 Teflon Valves Replaced - If cleaning the 2537 Teflon valves does not correct the problem, the valves may need to be replaced. AMNet recommends annual replacement of the 2537 V2 and V3 valves. When replacing the valves, do not over tighten the PFA tubing nuts.

2537 Cuvette Cleaned - Refer to Section 10.10 *Cuvette Cleaning* of the Tekran 2537 user manual for the proper procedure.

2537 Cuvette Replaced - If cleaning the cuvette does not correct the problem, the cuvette may need to be replaced. Refer to the Tekran 2537 user manual for the proper procedure.

2537 Pump Serviced – The model 2537A pump can be serviced. Servicing the pump includes replacing the brushes and diaphragm. Refer to Tekran Tech Note TN2537-004: *Pump Brushes Replacement Procedure – Model 2537* for the proper procedure. The model 2537B cannot be serviced. It should be replaced at the time of failure. Refer to Tekran Tech Note TN2537-006: *Pump Replacement Procedure – Model 2537* for the proper procedure.

1130 Heater Boot Replaced - If the 1130 elutriator heater does not reach the proper operating temperature, the heater may need to be replaced.

1130 Case Heater Replaced - If the 1130 case heater is at ambient temperature when in operation, it needs to be replaced.

1135 Case Heater Replaced - If the 1135 case heater is at ambient temperature when in operation, it needs to be replaced.

Heated sample line rinsed - If high blanks are observed and other troubleshooting techniques have been exhausted, the sample line may need to be cleaned. To clean, elevate one end of the line and flush the line with reagent grade water. Follow with a methanol rinse and dry with zero air.

Independent Survey Performed - An independent site survey should be performed at least once every 2 years. The AMNet Site Liaison will contact the site to schedule the site survey.

Swap 2537 – New Serial Number - If a second 2537 is available and is installed, record the serial number of the replacement unit. Verify that the scale factors are set properly.

Swap 2537 – New Cal Amount (pg) - Record the calibration mass of the new instrument. The calibration mass can be found in the calibration summary labeled HgAmt. Separate values are required for both the A and B cartridges.

Swap 1130 Pump Module – New Serial Number - If a second 1130 Pump Module is available and is installed, record the serial number of the replacement unit.

Swap 1130 Sampling Head – New Serial Number - If the 1130 sampling head (exterior box) is replaced, record the serial number of the replacement unit.

Swap 1135 sampling Head – New Serial Number - If the 1135 sampling head (exterior box) is replaced, record the serial number of the replacement unit.

Remarks, Block 5 - Enter any additional comments or explanation regarding the quarterly maintenance activities in this block. Please be concise and clear.

5. Remarks

Appendix

 National Atmospheric Deposition Program Atmospheric Mercury Network (AMNet) Site Report D					For office use only				
1. Site			2. Operator			3. Date (YYYY/MM/DD)			
Name: _____ ID: _____			Name: _____ Initial: _____						
4. Service Options Checklist									
Task	Done X	Period Impacted (local time, 24 hr)				Comments, Actions			
		MM/DD	23:50	MM/DD	23:55				
D01 25B7 Imp changed									
D02 Gold cartridges changed -- New serial number									
D03 25B7 teflon valves cleaned									
D04 25B7 teflon valves replaced									
D05 25B7 cuvette cleaned									
D06 25B7 cuvette replaced									
D07 25B7 pump serviced									
D08 1180 Heated boot replaced									
D09 1180 case heater replaced									
D10 1185 case heater replaced									
D11 Heated sample line rinsed									
D12 Independent survey performed									
Task	Value	Period Impacted (local time, 24 hr)				Comments, Actions			
		MM/DD	23:50	MM/DD	23:55				
D13 Swap 25B7 A - New Serial Number									
D14 Swap 25B7 A - New Col Hg amount (pg)									
D15 Swap 1180 Pump Module - New Serial Number									
D16 Swap 1180 Sampling Head - New Serial Number									
D17 Swap 1185 Sampling Head - New Serial Number									
5. Remarks									
Please upload the completed form to: http://nadp.isws.illinois.edu/upload/amn Problems? Contact Mark Olson at 608-335-4232									