

Wisconsin State Laboratory of Hygiene
NADP Program Office
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**NADP AMNet Standard Operating Procedure
Site Report B - Laboratory: Glassware Change-out/Monthly
Maintenance**



National Atmospheric Deposition Program

Wisconsin State Laboratory of Hygiene

NADP Program Office

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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 bi-weekly (i.e., with change-out of glassware) and monthly for each site in the NADP Atmospheric Mercury Network (AMNet). The activities described in this Standard Operating Procedure (SOP) document, *Site Report B - Laboratory: Glassware Change-out/Monthly Maintenance*, cover aspects of that maintenance that are completed in the laboratory, before going to the field site. This document identifies consumables that are required, and the tools necessary to perform the work. Clean, non-talc gloves must be worn when handling the Tekran equipment.

Field activities that must be completed bi-weekly (i.e., with change-out of glassware) and monthly are described in a separate document, *Site Report B - Field: Glassware Change-out/Monthly Maintenance*. Field activities are completed after the laboratory activities have been completed.

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

Glassware Change-out, Laboratory Activities

Table 1. Glassware Change-out, Laboratory Activities.

Maintenance required	Prepare and purge soda lime trap Clean, recoat and blank GOM denuder Prepare new trace-clean elutriator, including a new frit Prepare 1130 borosilicate sample filter
Consumables required	Soda lime trap Soda lime Glass wool Impactor disc 47mm borosilicate filter Reagent grade water Laboratory-grade methanol Quartz annular GOM denuder 2.4 M KCl Zero air source
Tools required	Clean, non-talc gloves Teflon-coated tweezers Filter wrenches Impactor disc removal/installation tool Impactor installation and removal tools Tube furnace Vacuum source to coat denuder

Soda lime traps – Use ONLY high quality, mercury free, 4-8 mesh soda lime. Re-pack existing soda lime traps or use pre-packed, pre-purged traps from the instrument manufacturer. Refer to Tekran Tech Note 1130-304: *Model 2537 and 1130 Sodalime Trap* for replacement procedure.

Cleaning, coating and blanking denuder - Tekran Tech Note 1130-307: *EPA Denuder Recoating Procedure* details the steps needed for cleaning, recoating and blanking new and used denuders.

Cleaning elutriator – Use of a spare elutriator is recommended. This allows the elutriator to be cleaned in a controlled environment. Refer to *Cleaning External Glassware and Cleaning the Impactor* in the Tekran 1130 user manual for details. AMNet recommends using the inlet and outlet tools for impactor disc removal and replacement for this procedure.

- Step 1. Remove elutriator assembly.
- Step 2. Separate the elutriator into its' four components: GL25 union, upstream tee, impactor body and impactor inlet (Figure 1).
- Step 3. Screw the impactor removal tool into the inlet of the impactor body (Figure 2).
- Step 4. Insert the prongs into the three holes on the outlet of the impactor.
- Step 5. Remove the impactor disc by gently pressing downward on the impactor removal tool.
- Step 6. Unscrew the impactor removal tool and discard the used impactor disc.
- Step 7. Screw the impactor installation tool into the outlet end of the impactor body (Figure 3).
- Step 8. Identify the narrow tapered end of the impactor disc.
- Step 9. Center disc, tapered end in, over the cylindrical holder. Use the flat end of the impactor removal/installation tool to press the disc into place.
- Step 10. Remove visible debris by wiping the inside of inlet glassware with a long cotton swab.
- Step 11. Rinse all elutriator components thoroughly with reagent grade water.
- Step 12. Rinse all elutriator components with laboratory-grade methanol.
- Step 13. Allow components to dry then reassemble elutriator assembly. Ensure the impactor disc is facing the inlet.
- Step 14. Place the new, trace-clean impactor glassware in a double zip-type bag for storage and transport to site.



Figure 1. Tekran Model 1130, elutriator components.

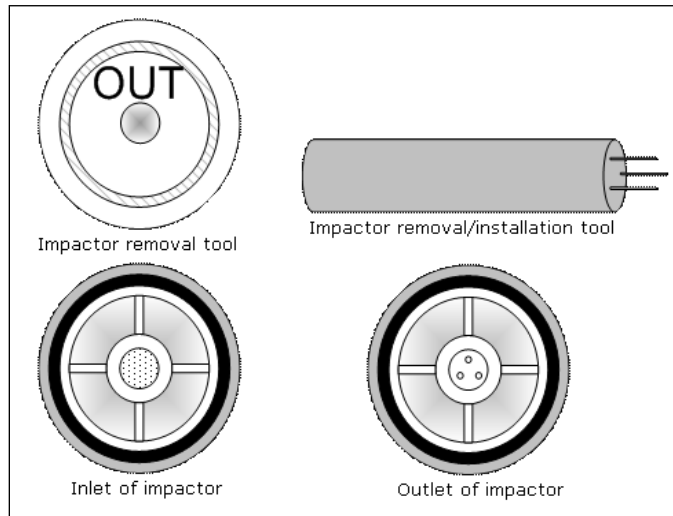


Figure 2. Impactor and removal tools.

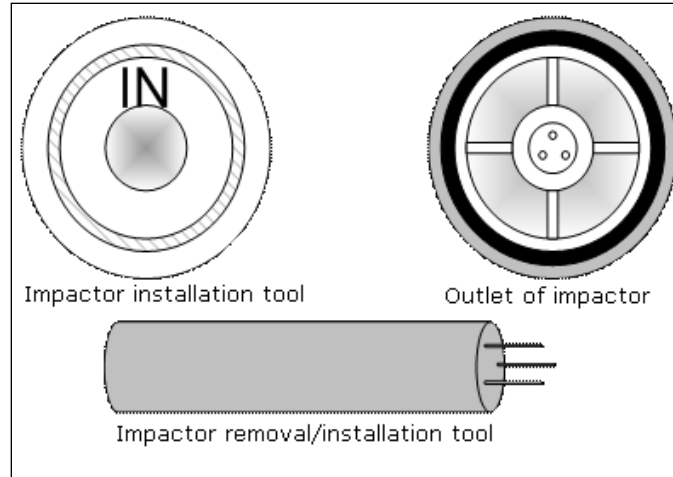


Figure 3. Impactor and disc installation tools.

1130 sample filter change

A complete set of back-up filter holders is recommended. This allows the filter to be changed in a controlled environment.

- Step 1. Disassemble filter housing using a pair of filter wrenches.
- Step 2. Remove and discard old quartz fiber filter.
- Step 3. Install a new quartz fiber filter using clean, Teflon-coated tweezers. Ensure that the smooth side faces down.
- Step 4. Place the inlet over the outlet housing. Ensure the filter remains flat and forms a seal.
- Step 5. Hand-tighten the retaining ring. The inlet housing should not spin on the outlet housing.
- Step 6. Tighten the retaining ring using the filter wrenches. Note: this is a common leak point.
- Step 7. Cap the inlet and outlet ends with plastic travel caps. Store the housing in a double zip-type bag for transport to the site.

Monthly Maintenance, Laboratory Activities

Table 2. Monthly Maintenance, Laboratory Activities.

Maintenance required:	Clean and repack the RPF Clean GL 14-18 union Clean 1130 zero air filter housing and replace filter.
Consumables required:	Regenerable particulate filter (RPF) Quartz RPF filter Baked Quartz wool 47 mm Teflon filter Cleanroom lab wipes Reagent grade water Laboratory-grade methanol Zero air source
Tools required:	Clean non-talc gloves Wire for RPF removal Teflon-coated tweezers Pair of filter wrenches Pair of adjustable wrenches Tube furnace

Cleaning, repacking and blanking the regenerable particulate filter

- Step 1. Remove the inlet cap in the RPF.
- Step 2. Remove the quartz wool plug and filter from the RPF using the nichrome wire removal tool. The filter sits tightly on the glass frit and may need to be picked at to remove
- Step 3. Cut two 4 x 8 cm pieces from a cleanroom lab wipe.
- Step 4. Pierce the center of a piece of the cleanroom lab wipe with the nichrome wire. Place a few drops of reagent grade water on the lab wipe and fold it over itself so it is on one side of the wire. Run the lab wipe along the inside walls of the RPF inlet.
- Step 5. Repeat Step 4 using methanol instead of reagent grade water.
- Step 6. Cut two 1 x 3 cm pieces from a cleanroom lab wipe.
- Step 7. Pierce a piece of the cleanroom lab wipe with the nichrome wire. Place two drops of reagent grade water on the lab wipe and fold it over itself so it is on one side of the wire. Run the lab wipe along the inside walls of the RPF tail.
- Step 8. Repeat Step 7 using methanol instead of reagent grade water.
- Step 9. Purge RPF with zero air and allow it to dry.
- Step 10. Curl a quartz filter disk to fit it through the inlet opening. Slide the curled disk down the tube using the nichrome wire. When the filter reaches the frit, use the nichrome wire to uncurl the filter and tap into place. Ensure the filter is centered and flat on the frit. Ensure the filter seals the entire

- frit and along the sides.
- Step 11. Replace the quartz wool plug using clean, baked quartz wool. Fold a 2 x 3 cm piece of quartz wool into a cylinder. Insert the wool cylinder into the inlet using the wire tool. Position the quartz wool between the dimples to hold the filter in place.
- Step 12. Place the main body of the RPF into a tube furnace. Attach a zero air source to the RPF tail. Bake at 800°C for 30 minutes while mercury-free air passes through the RPF at a rate of 1 lpm.
- Step 13. Allow the RPF to cool, then cap both ends.
- Step 14. Initial and date the RPF as repacked and baked. Use a permanent marker and write over the pyrolyzer section. The writing will burn off during desorption.
- Step 15. Store in a clean safe place to avoid breakage.
- Note:** Cleaning or changing of the quartz chips in the pyrolyzer is covered in the Tekran user manual.

GL 14-18 union cleaning

- Step 1. Rinse GL 14-18 union with reagent grade water.
- Step 2. Inspect gaskets and tubing for visible debris. Remove debris with moistened cotton swab.
- Step 3. Rinse GL 14-18 union with laboratory grade methanol.
- Step 4. Allow to dry and place in double zip-type bag for storage.

1130 Zero air filter replacement

- Step 1. Disassemble the filter housing using a pair of filter wrenches. Remove and discard the old Teflon filter.
- Step 2. Install a new 1µm Teflon filter using a pair of clean, Teflon-coated tweezers. Ensure the smooth side faces up.
- Step 3. Place the inlet over the outlet housing. Ensure the filter remains flat and forms a seal.
- Step 4. Hand-tighten the retaining ring. The inlet housing should not spin on the outlet housing.
- Step 5. Tighten the retaining ring using the filter wrenches. Note: this is a common leak point.
- Step 6. Cap the inlet and outlet ends with plastic travel caps. Store the housing in a double zip-type bag for transport to the site.