

**Standard Operating Procedure for
Air Sampling for Semivolatile Organic
Contaminants Using the Organics
High-Volume Sampler**

**Clyde W. Sweet
Office of Air Quality
Illinois State Water Survey
2204 Griffith Drive
Champaign, IL 61820**

December 1993

Standard Operating Procedure for Air Sampling for Semivolatile Organic Contaminants Using the Organics High-Volume Sampler

1.0 Overview

This SOP is intended to provide a step by step procedure for collecting airborne suspended particles on quartz fiber filters and airborne semivolatile organic contaminants on XAD-2 resin cartridges using a High-Volume (Hi-Vol) sampler.

The data collected from analyses of 20.3 x 25.4 cm quartz filters and XAD-2 cartridges from the organics Hi-Vol samplers will be used primarily for the Lake Michigan Loading Study (LMLS) and the Integrated Atmospheric Deposition Network (IADN) programs. Samples at the Sleeping Bear Dunes site, which is part of the Integrated Atmospheric Deposition Network, were sampled and analyzed by Indiana University. The sampling method is identical apart from a few minor differences in QC samples. This site represents 10 % of the samples for this method. The objectives of the programs are to determine the loadings of persistent toxic contaminants from the atmosphere to the Great Lakes from both urban and regional sources. Sampling sites have been strategically located around the Great Lakes basin to provide these estimates.

A modified Hi-Vol sampler is used for the collection of suspended particles and organic contaminants in air. The modification consists of an aluminum cylinder behind the filter holding a XAD-2 cartridge. Specific analytes of interest that will be collected from this sampler are listed in Table 1. The sampler operates for one 24-hour period every 12 days. Samples are collected during the week following the installation of filters. Therefore, every other week, the sampler will not contain filters or a cartridge, unless blanks are run.

The flow rate through the sampler is 34 cubic meters per hour. This interval is used because of the need to collect about 800 cubic meters of air in order to get a reliable measurement of the target contaminants at the remote sites in the network. Because of the low concentrations of target compounds, the operator must follow this protocol carefully to insure sample integrity.

This sample will be collected by passing air through a 20.3 x 25.4 cm quartz filter and then through an XAD-2 resin cartridge. The sampler inlet is a standard TSP shelter. The filters, which are pre-cleaned and pre-weighed at the Illinois State Water Survey (ISWS), and the XAD-2 cartridge are shipped to the site, and returned to ISWS for analyses. The analytical methods are documented in laboratory SOPs.

The following procedure is used by the field operator to maintain the organics Hi-Vol sampler, and to remove and replace glass fiber filters and XAD-2 cartridges in a manner that will maintain sample integrity. Dates of operation and sample collection will be provided in the monthly site operation protocol. Generally one filter and cartridge sample will be collected every 12 days. The site must be visited each week to collect samples and set-up samplers for the next week's sample collection. Any questions on the sampling methods or operation of equipment should be directed to the following individuals. The Principal Investigator will be the prime contact for all methodological and general questions. The EPA Project Lead is the second contact if the Principal Investigator cannot be contacted.

**Table 1. Elements/Contaminants to be Determine
 on Glass Fiber Filters and XAD-2 Resin**

Filter	Parameter
Glass fiber	Total suspended particles Organic Carbon
XAD-2	<p>PCB Congeners</p> <p>Chlorinated Pesticides a-HCH g-HCH p,p' DDT and metabolites HCB Dieldrin Alpha-chlordane Gamma-chlordane Trans-nonachlor Atrazine</p> <p>PAHs acenaphthylene acenaphthene fluorene phenanthrene anthracene fluoranthene pyrene chrysene benzo(a)anthracene benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene indeno(123cd)pyrene dibenzo(a,h)anthracene benzo(ghi)perylene retene coronene benzo(e)pyrene</p>

Sampling Protocol and General Operations

Principal Investigator:

Clyde W. Sweet
Illinois State Water Survey
2204 Griffith Dr.
Champaign, IL 61820

Phone: 217-333-7191
Fax: 217-333-6540

Project Lead:

Angela Bandemehr
USEPA/GLNPO
77 W. Jackson
Chicago, IL 60604

Phone: 312-886-6858
Fax: 312-353-2018

Equipment Operation and Maintenance

Paul Nelson
Illinois State Water Survey
Phone: 217-244-8719
Fax: 217-333-6540

Supplies and Packaging

Mike Snider
Illinois State Water Survey
Phone: 217-244-8716

2.0 Summary of Method

Site operators will visit the site weekly to check for proper functioning of equipment and to either collect a sample or set-up the sample collector. Samples will be collected on the prescribed day. If it is raining or snowing, or hazardous conditions prevail, samples may be collected later in the day at the discretion of the site operator. If the sample can not be collected on the prescribed sampling day, the Principal Investigator must be notified. The following sampling activities will take place in the order listed.

- 1) Initial equipment inspection and testing.
- 2) Filter/cartridge removal and labeling.
- 3) Packaging filter/cartridge and sample report form for shipment.
- 4) Installation of a new filter/cartridge and setting flow rate.
- 5) Resetting the sampler timer.
- 6) Waste disposal and clean up.
- 7) Sample shipment.

Steps 1 through 3, 6 and 7 will be conducted when the filters are changed and Steps 1 and 4 through 6 during collector set-up. Each of these steps will be detailed in the following sections.

3.0 Sample Handling and Preservation

Due to the expense of sampling and analyzing the quartz filters and XAD-2 cartridges, a limited number of sites have been selected in order to achieve the goals of this study. Therefore, every sample is important and represents a significant portion of that site's yearly estimate. Any contamination through mishandling or lack of preservation could cause a bias in the program estimates. The filter/cartridge should only be removed from, and installed into the holders in an enclosed area. The cartridges should be at the same temperature as the holders to avoid a tight fit due to thermal expansion.

Once in place, the filters should not be removed until the end of the sampling cycle (one 24-hour sampling period over a 12-day period). Follow all procedures for filter removal, packaging and shipment.

4.0 Interferences

Due to the nature of the chemicals being collected, all precautions should be taken to avoid contamination of the sample and sampler during weekly visits and sample collection. The sampler functions to collect samples of airborne particles that will be analyzed for the parameters list in Table 1. It is very important to avoid touching the filters and to prevent any dust or dirt from contaminating the deposit on the filter. The surfaces on the organics hi-vol inlet should be inspected each week and any dust or dirt wiped away with a damp cloth.

5.0 Safety

In any field operation, emphasis must be placed on safety. Site operators must be aware of the potential safety hazards to which they are subjected. Follow all safety protocols and equipment guidelines, and be prepared for emergency situations. The site operator is responsible for his/her safety from potential hazards including but not limited to:

- 5.1 Travel: When traveling to the site be sure to check on road conditions and weather advisories. Carry emergency supplies (warm clothing, food, water) when traveling in the winter. Always let someone know where you're going and when you expect to be back. Always carry a first aid kit.
- 5.2 Electrical: For obvious problems (fire, scorching, blown fuses), turn off the power for the circuit involved and notify ISWS. Never attempt electrical repairs other than replacing fuses and circuit boards. Unplug the sampler before making replacements. Be especially cautious if conditions are wet.
- 5.3 Insect pests: If you are allergic to insect stings, you should carry a kit prescribed by a physician. Be especially cautious if nests or large numbers of stinging insects are present. Notify ISWS of all problems.

6.0 Equipment and Supplies

Careful use, proper maintenance and cleaning extends the life of serviceable field equipment. Permission should be obtained from the Principal Investigator to use anything other than the equipment and supplies mentioned in this list (supplied by ISWS).

6.1 Serviceable Equipment

These items will stay at the site at all times.

- Modified Hi-Vol sampler for organics (pump and timer unit, inlet shelter)
- Filter holder with snap-on cover
- XAD-2 cartridge holder
- Fine forceps

6.2 Consumable Equipment

These items will be sent to the site operator in bulk or once every four weeks.

- Pre-weighed, numbered quartz fiber filters
- XAD-2 cartridges
- XAD-2 transport tins
- Teflon tape
- Black electrical tape
- Latex gloves
- Spare fuses
- Kimwipes

7.0 Calibration and Standardization

The Hi-Vol sampler will be checked quarterly against a standard orifice by ISWS personnel. A magnehelic gauge provides a flow check before and after each sampling run.

7.1 Sampler Inlet

Each week check the condition of the sampler inlet and the quartz fiber filter cover plate. Wipe up any dust and dirt using a damp Kimwipe.

7.2 Timer and Pump Unit

Figure 1 shows the mechanical timer and Figure 2 shows the electronic timer. Each week check the operation of the timer and pump. The following checks should be made:

- 1) The time of day should be correct to local time.
- 2) The "Total Sampling Time" should have advanced 24 hours (1440 minutes) from the previous week, if a sample period was programmed during the preceding week.

Turn on the pump manually (see Section 8.1) and let it run for two minutes to determine magnehelic reading.

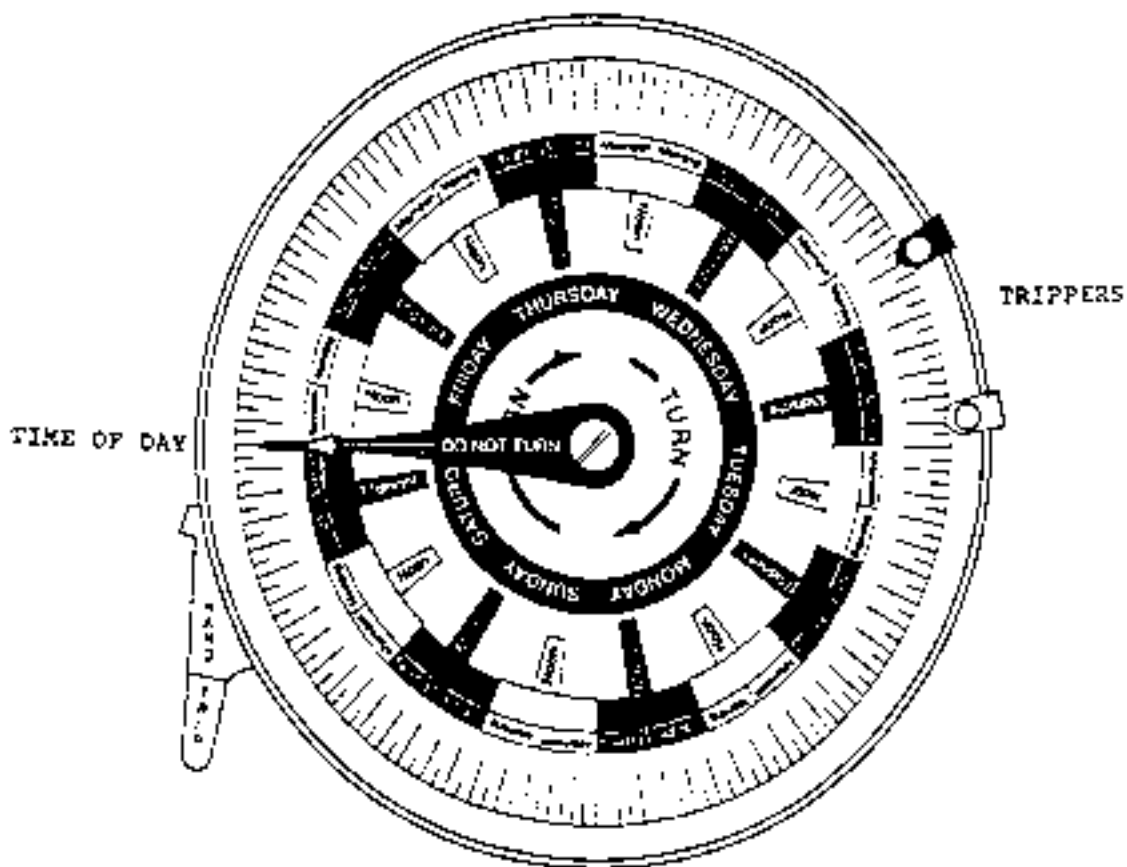


Figure 1. Mechanical Timer

8.0 Procedures

The following procedures will be discussed:

- 1) Initial Inspection.
- 2) Filter/cartridge removal and labeling.
- 3) Filter/cartridge packaging for shipment.
- 4) Installation of new filter/cartridge.
- 5) Setting the clock and sample timer.
- 6) Waste disposal/clean-up.
- 7) Sample shipment.

Steps 1 through 3, 6 and 7 will be conducted when the filters are changed (every two weeks) and Steps 1 and 4 through 6 during collector set-up. Each of these steps will be detailed in the following sections.

8.1 Initial Inspection (mechanical timer).

Note: This timer is on most of the Organics Hi-Vols.

Upon arrival at the site, make an initial inspection of the equipment to determine proper operation for the week. This procedure is accomplished every week. When a sample is set up, this procedure should be used to check final settings before leaving the site. Refer to Figure 1 for timer details. Check the elapsed time counter reading on the lower left corner of the timer. Record this number on the Data Reporting Form. The counter reads in hundredths of an hour. The large red arrow should point to the correct day and time.

Turn on the sampler by moving the "*Hand Trip*" switch to the "*On*" position and note whether the pump is running normally. After two minutes, record the value on the magnehelic on the Sample data Sheet and the Weekly Site Visit Sheet. Turn the sampler off after two minutes.

This inspection, which should be entered into the Weekly Site Visit Sheet and the Sample Data Sheet, will include:

- 1) General comments. Comments that might affect the sample collection that week, i.e., fire in the area, wind storms, abnormal precipitation, vandalism, etc.
- 2) Equipment evaluation. Note any damage to equipment. If the sampler is not operating properly, notify ISWS as soon as possible.
- 3) Magnehelic reading.
- 4) Total Sampling Time reading.

8.2 Initial Inspection (electronic timer).

Note: This timer is installed in most of the TSP Hi-vols and some of the organics Hi-vols.

Upon arrival at the site, make an initial inspection of the equipment to determine proper operation for the week. This procedure is accomplished every week. When a sample is set up, this procedure should be used to check final settings before leaving the site. Refer to Figure 2 for timer details. Check the timer to confirm that the following settings:

The "Power" switch should be "On"

- The "Set" switch should be on "Display"
- The "Display" switch should be in "Time of the Day" position
- The "Sampler" switch should be in "Timer" position
- The "Sample After" should be on the setting required on the previous week.
- The "Sample Every" switch should be on nine day setting.
- The "Sample For" switch should be on the 24 hour setting.

If, on the prior week, the sampler was set to collect a sample, the *Total Sampling Time* reading on the timer should have advanced 1440 minutes. Check this reading and record it on the Data Reporting Form.

Turn on the sampler by moving the "Sampler" switch to the "On" position and note whether the pump is running normally. After two minutes, record the value on the magnehelic on the Weekly Site Visit Sheet and the Sample Data Sheet. Turn the sampler off after two minutes.

This inspection, which should be entered into the Weekly Site Visit Sheet and the Sample Data Sheet, will include:

- 1) General comments. Comments that might affect the sample collection that week, i.e., fire in the area, wind storms, abnormal precipitation, vandalism, etc.
- 2) Equipment evaluation. Note any damage to equipment. If the sampler is not operating properly, notify ISWS as soon as possible.
- 3) Magnehelic reading.
- 4) *Total Sampling Time* reading.

8.3 Filter/Cartridge Removal and Labeling

At the end of a sampling cycle, the filter and cartridge are removed by the following procedure. The quartz fiber filter should not be touched, and should be placed in aluminum foil as soon as possible. The following procedures are accomplished only during the replacement of the filter/cartridge.

8.3.1 Glass Fiber Filter Removal

- 1) Turn on the sampler manually and record the magnehelic gauge reading after two minutes.
- 2) Lift the triangular hood of the sampler in order to extract the filter holder. The filter is protected by a filter cover plate that exposes the filter during the sampling period. This plate should be covering the filter. While unscrewing the filter holder leave this plate down. Remove the filter holder from the sampler by unscrewing the nuts on the corners of the holder in a diagonal pattern. Let the nuts fall to side, freeing the filter holder.
- 3) Lift the filter cover plate and remove the filter holder. Place the snap-on filter cover over the filter holder to protect the filter from dust when transporting it to the enclosure. Close the sampler hood and transport the filter holder to an enclosed area.
- 4) Once in an enclosed area, remove the snap-on filter cover. Remove the quartz fiber filter by unscrewing the outer casing of the filter holder which is held on by nuts on the short sides of the filter holder.
- 5) Place latex gloves on. Remove the filter and fold it in half lengthwise with the deposit side facing in. Wrap the filter securely in the same piece of aluminum foil that the filter originally came in (the dull side of the foil should face the filter). Attach a label on the outside of the aluminum foil and place the filter in a zip-lock plastic bag.

8.3.2 XAD-2 Cartridge Removal

Refer to Figure 3.

- 1) Open the front door of the sampler, exposing the cartridge holder. To remove holder, loosen the hand screw nut on the *top* of the cartridge holder. Once the top has been completely loosened and off, proceed to unscrew the *bottom* nut. This nut remains on the cartridge holder. Remove the cartridge holder and transport the holder to an enclosed area.
- 2) Once inside the enclosure, turn the cartridge holder upside down in order to remove the stainless steel cartridge containing the XAD-2 resin.

Wrap the XAD-2 cartridge in aluminum foil and place the resin cartridge into the resin cartridge transport tin. Seal the tin by placing a piece of Teflon tape around the area where the top and bottom meet. Cover this with black electrical tape. Place a label on the tin.

8.3.3 Sample Labeling

All organics Hi-Vol air samples should be labeled using the same alphanumeric system. The label includes:

The "Site ID" letter for the site,

The "Sample" which will be "H" for Hi-Vol samples and "T" for TSP samples.

The "Sample Type", designating either a routine sample (01), duplicate (02), or a QA sample,

The "Matrix" designation, "F" for the glass fiber filter and "C" for the XAD-2 resin cartridge and,

The "Date" of collection in a year-month-day format.

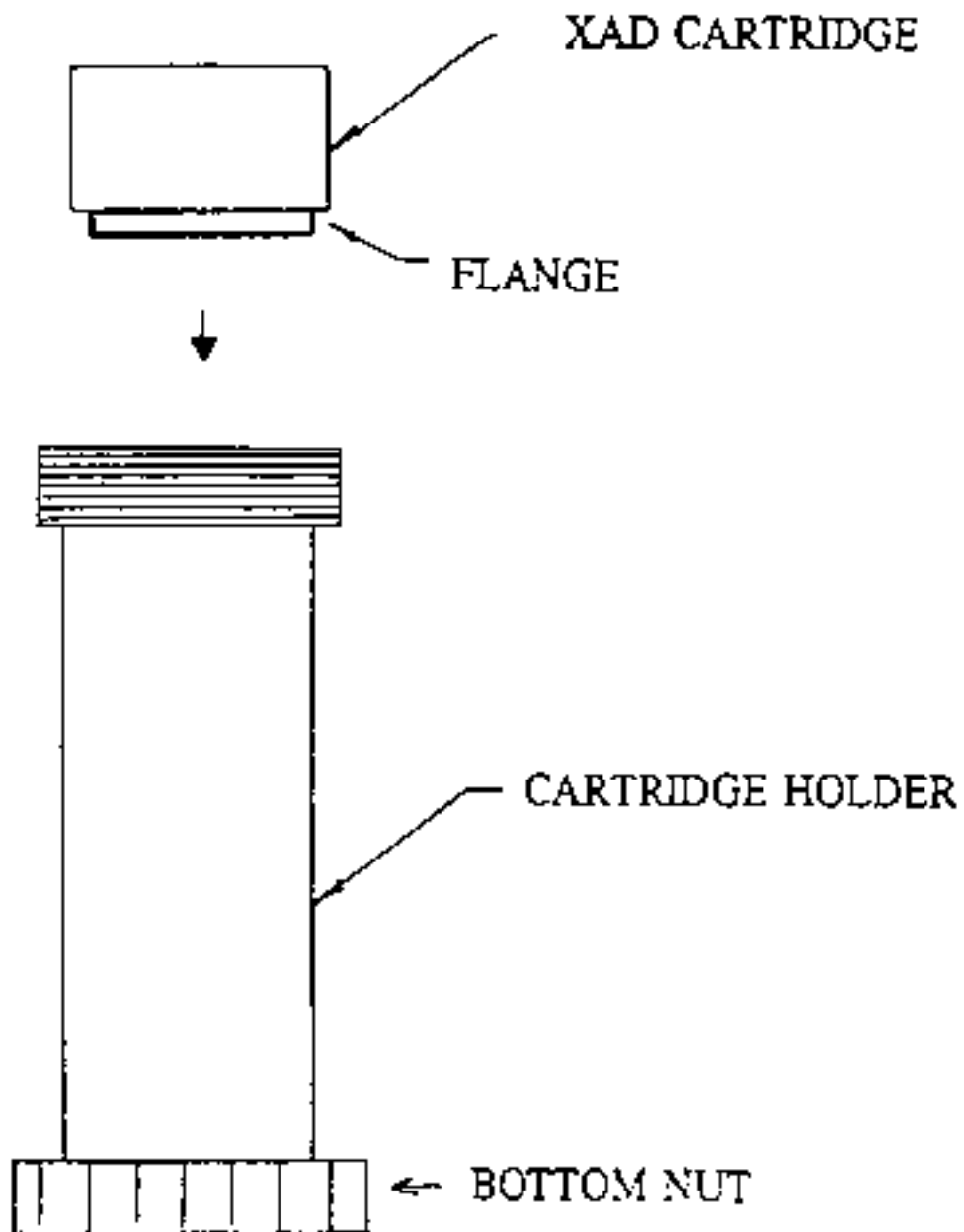


Figure 3. XAD-2 Cartridge and Cartridge Holder

An example label and the valid codes are listed below.

Hi-Vol Sample						
		-		-		
Site	Sample	Samp.Type	Matrix	Year	Month	Day

Valid Codes

<u>Site ID</u>	<u>Sample</u>	<u>Sample Type</u>
U-Brule River	S-Sleeping Bear Dunes	H- Hi-Vol
C-Champaign	B-Beaver Is.	T- TSP
N-Manitowoc	E-Eagle Harbor	
W-Chiwaukee	T-Sturgeon Point	<u>Matrix</u>
V-South Haven	I-Indiana Dunes	
M-Muskegon	J-IIT Chicago	C- XAD Cartridge
L-Lake Guardian		F- Filter

Example: SH-01C-930119 is the code for a routine organics Hi-Vol XAD-2 sample collected at the Sleeping Bear Dunes site on January 19, 1993.

8.4 Filter Packaging for Shipment

The filter and cartridge should be shipped in a in a box with packing material. They may be shipped together with other samples.

8.5 Installation of New Filter/Cartridge

At the start of a new sampling cycle, a new filter and cartridge should be installed. The monthly site protocol will list the dates that installation of the filter and cartridge is to take place.

8.5.1 Quartz Fiber Filter Installation

- 1) Examine the filter holder. It should be wiped clean with a damp (DI water) cloth if necessary.
- 2) Place on a pair of latex gloves. Within the enclosure, unwrap one of the pre-weighed and place it in the filter holder, *numbered side facing up*. Save the aluminum foil in a plastic bag for use when returning the exposed filter.
- 3) Close the filter holder by tightening the screw nuts on either side of the holder.
- 4) Place the snap-on filter covering over the filter holder for transport to the sampling device.
- 5) At the sampling device, lift up the sampler hood and the filter cover plate.

Remove the snap-on filter covering and place the filter holder into the proper position.

- 6) Place the filter holder nuts onto the filter holder and tighten diagonally. Place the filter cover plate over the filter holder and close the sampler hood.

8.5.2 XAD-2 Cartridge Installation: Refer to Figure 3.

- 1) Place on a pair of latex gloves. Within the enclosure, open a new resin cartridge sampling tin and unwrap the aluminum foil.
- 2) Place the XAD-2 cartridge into the cartridge holder *with the flange facing down*. Transport the cartridge holder to the sampler.
- 3) At the sampler, open the sampling door, make sure the orange o-ring at the bottom of the cartridge holder is seated in the proper groove. Install the cartridge holder, *bottom end first*, screwing the hand screw nut on the cartridge onto the threaded pump device.
- 4) Make sure the orange o-ring at the top of the cartridge holder is in place and screw the top of the cartridge holder into place by holding the cartridge holder steady and using the hand screw nut to tighten onto the threaded end of the cartridge holder.
- 5) Turn the sampler on. If the motor does not run smoothly, there may be a leak. Retighten the fittings on the filter and cartridge holders. Once the motor is running smoothly, record the magnehelic reading after two minutes.

8.6 Setting the Clock and the Timer

8.6.1. Mechanical Timer

This procedure is used during sample set-up in samplers with mechanical timers. Refer to Figure 1 for timer details.

- 1) Turn the large ring clockwise so that the red pointer points to the correct day and time.
- 2) Attach the switch trippers to the timer ring. The *silver*-colored tripper should be positioned at the start day and time and the *black* tripper on the end day and time specified in the monthly site protocol. The trippers should be attached so that the thumb screw is to the front. The screws should be hand tightened so that the trippers rest firmly against the rim of the ring.
- 3) Be sure to record the elapsed time reading.

8.6.2 Electronic Timer

This procedure is used during sample set-up in samplers (TSP samplers and a few of the organics Hi-vols) with electronic timers. Refer to Figure 2 for timer details.

- 1) Check whether the "*Time of the Day*" display is correct. Toggle to the "*Sample Start Time*" and see if this reads "09.00". Record any deviations on the site log and on the sample data sheet. To reset either setting, place the "*Display*" switch to the proper setting and use the "*Fast/Slow*" toggle to make adjustments. The "*Time of the Day*" should be the current time using military units. The "*Sample Start Time*" should be set to "09.00". The sample start time must be at least 30 minutes after the time of day and *the function switch must be left in the "Time of the Day" position.*

To set up the sample run:

- 2) Position the "*Sample After*" switch to the number of days to be skipped before the start of the first sampling period. This position will change each week and will need to be calculated from the sampling date specified in the monthly site protocol. Position "0" will initiate sampling the first time the "*Time of Day*" equals "*Sample Start Time*". For example if the present time is 10:00 and the sample start time is 09:00 sampling will start 23 hours later. If position "1" is selected, sampling will start one day + 23 hours later at 09:00.
- 3) The "*Sample Every*" switch sets the sampler to repeat the sampling cycle after the indicated number of days. This switch should be left in the maximum position (nine days) unless otherwise directed.
- 4) The "*Sample For*" switch sets the sampling time in hours and should be left at the 24-hour setting unless directed otherwise.

Note: Some of the samplers have positive detent switches rather than knobs. These must be seated in the detent to control the sampler.

- 5) Set the "*Sampler*" switch to the "*Timer*" position. Finally, push the "*Set*" switch down to the "*Timer*" position momentarily and release. This enters the new sampling program. This initializes all timing functions. These steps must be done last, after all other switches have been set.
- 6) Be sure to record the *Total Sampling Time* reading.

Check the timer to confirm that the following settings:

- The "POWER" switch should be "ON"
- The "SET" switch should be on "DISPLAY"
- The "DISPLAY" switch should be in "TIME OF DAY" position

- The "SAMPLER" switch should be in "TIMER" position
- The "SAMPLE AFTER" should be on the setting required for the next sampling period.
- The "SAMPLE EVERY" switch should be on nine day setting.
- The "SAMPLE FOR" switch should be on the 24 hour setting.

8.7 Waste Disposal and Clean-up

Waste may include materials used to clean the inlet and packaging materials. Dispose of these properly.

8.8 Sample Shipping

Once they are properly packaged (8.4), send the samples, Sample Data Sheets, and the Weekly Site Visit Sheet to the Principal Investigator. Keep a copy of the both Sheets in the site log book. UPS 2nd day delivery is the preferred shipping method. U.S. Priority mail may also be used.

8.9 Quality Assurance Samples

Occasionally the protocol will require collection of quality assurance samples. Travel blanks are filters that are shipped with regular sample filters and stored at the site during the collection period. They should be returned to ISWS unopened after the specified period. Field blanks are filters that are installed in the sampler during the sampling period. The sampler should be unplugged or the silver tripper removed so that the sampler does not run. On samplers with electronic timers, the "SAMPLER" switch is turned off so that the sampler does not run. These samples should have a "TB" or "FB" in the sample code (Section 8.3.3). They are run to assess overall contamination during periods when the cartridge and filter are installed in the sampler but no air is being sampled. Specific instructions will be included in the shipping box for the implementation requirements of these samples.

8.10 Equipment Maintenance and Trouble Shooting

The sampler is exposed to weather, and wind-blown dust and should be cleaned each week by wiping dirty surfaces with a clean damp cloth.

The operation of the sampler should be checked each week. If the pump does not run or there is a problem with the timer display, consult the trouble shooting guide below and contact ISWS. For more information, consult the site operator's manual or contact the manufacturer, Andersen Samplers Inc., 4215 Wendell Dr., Atlanta, GA, 800-241-6898. Table 3 includes some trouble shooting information.

On samplers with electronic timers, a flashing timer indicates that a power failure has occurred. Reset the timer and notify ISWS.

Table 3. Trouble shooting

SYMPTOM/CAUSE	REMEDY
<u>Collector fails to operate</u> No power to instrument	Check switches and power source. Reset circuit breaker.
<u>Circuit breaker continues to break</u> Electrical short	Instrument needs servicing
<u>Motor speed not steady</u> Air leak	Tighten filter holder screws and cartridge holder nuts
<u>Timing or programming error</u> "SAMPLER" switch not on "TIMED", or "SAMPLE EVERY" not in proper position "DISPLAY" switch not on "TIME OF DAY"	Check that the switches are in detents and all instructions have been followed (see Section 2.4.2)

Occasionally motor replacement may be necessary. Figure 4 gives a step-by step description for removal of the old motor. Follow the sequence in reverse to install a new motor. This diagram applies only to IADN master sites (Eagle Harbor, Sleeping Bear, and Sturgeon Point).

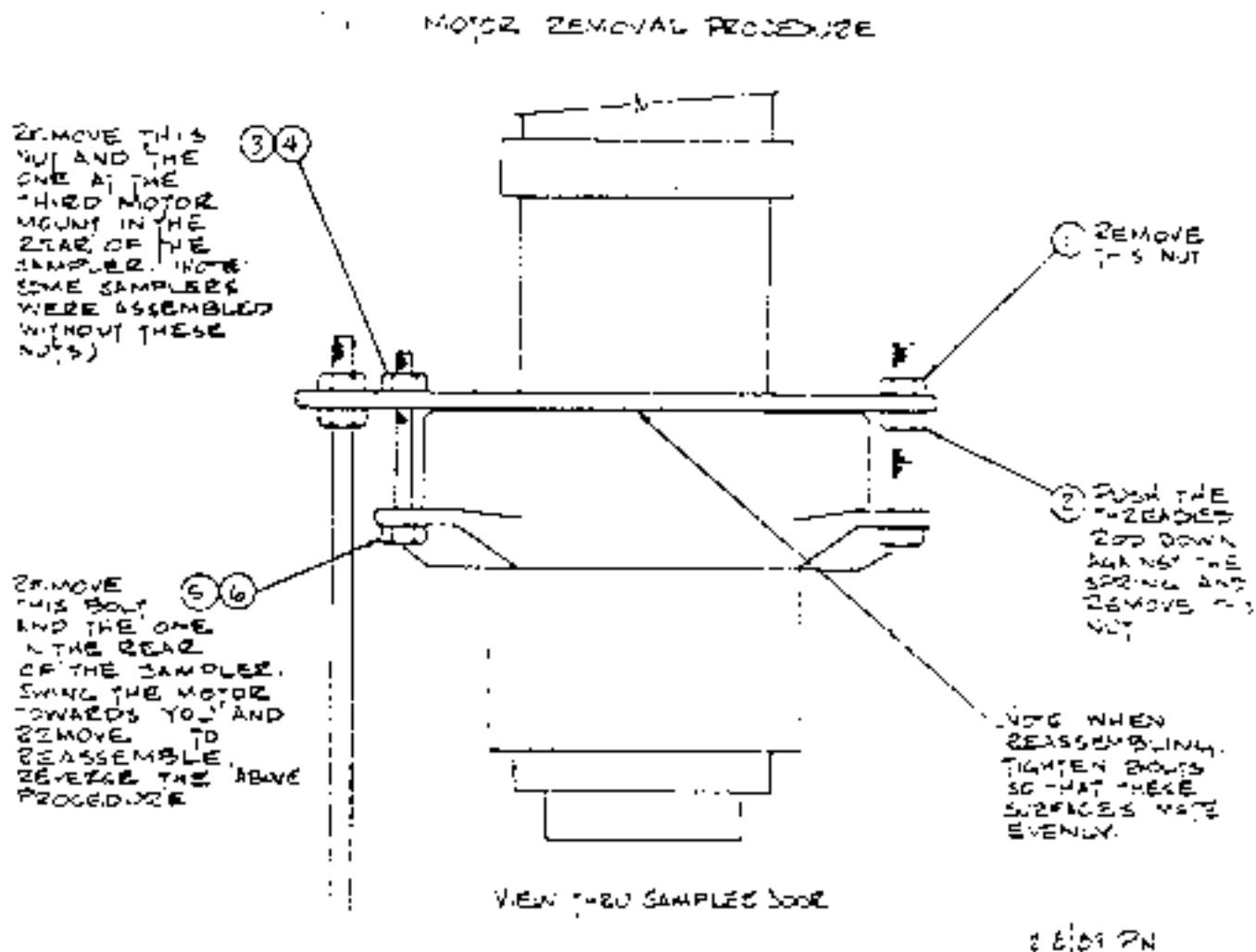


Figure 4. Motor Installation

High-Volume Summary

This summary does not take the place of the detailed SOP and should be used strictly to reinforce the procedure when in the field. Steps 1 through 3 will be conducted when the filters are changed, and Steps 1, 4 and 5 during collector set-up.

1.0 Initial Inspection

Upon arrival at the site, make an initial inspection of the equipment to determine proper operation for the week. This inspection will be entered into the Weekly Site Visit Sheet.

- 1.1 General comments. Comments that might affect the sample collection that week, i.e., fire in the area, wind storms, abnormal precipitation, vandalism, etc.
- 1.2 Equipment evaluation. Note any damage to equipment. If the sampler is not operating properly, notify ISWS as soon as possible.
- 1.3 Clean sampler inlet.
- 1.4 Magnehelic reading.
- 1.5 Total Sampling Time reading.

2.0 Filter/Cartridge Removal and Labeling

- 2.1 Glass Fiber Filter Removal
 - 2.1.1 Turn on the sampler and record the magnehelic reading after two minutes.
 - 2.1.2 Lift the triangular hood of the sampler in order to extract the filter holder. The filter is protected by a filter cover plate that exposes the filter during the sampling period. This plate should be covering the filter. While unscrewing the filter holder leave this plate down. Remove the filter holder from the sampler by unscrewing the nuts on the corners of the holder in a diagonal pattern. Let the nuts fall to side, freeing the filter holder.
 - 2.1.3 Lift the filter cover plate and remove the filter holder. Quickly place the snap-on filter covering over the filter holder to protect the filter from dust when transporting it to the enclosure. Close the filter hood and transport the filter holder to an enclosed area.
 - 2.1.4 Once in an enclosed area, remove the snap-on filter cover. Remove the quartz fiber filter by unscrewing the outer casing of the filter holder which is held on by nuts on the short sides of the filter holder.

2.1.5 *Place latex gloves on.* Remove the filter and fold the filter in half lengthwise with the deposit side facing in. Wrap the filter securely in the same piece of aluminum foil the filter came with, attach a label to the aluminum foil, and place the filter in a zip-lock plastic bag.

2.2 XAD-2 Cartridge Removal

2.2.1 Open the front door of the sampler, exposing the cartridge holder. To remove holder, loosen the hand screw nut on the *top* of the cartridge holder. Once the top has been completely loosened and off, proceed to unscrew the *bottom* nut. This nut remains on the cartridge holder. Remove the cartridge holder and transport the holder to an enclosed area.

2.2.2 Once inside the enclosure, turn the cartridge holder upside down in order to remove the stainless steel cartridge containing the XAD-2 resin. Wrap the XAD-2 cartridge in aluminum foil and place the resin cartridge into the resin cartridge transport tin. Seal the tin by placing a piece of Teflon tape around the area where the top and bottom meet then secure with electrical tape. Attach a label to the outside of the transport tin.

3.0 Filter Packaging for Shipment

The filter and cartridge should be shipped in a box with packing material. They may be shipped together with other samples.

4.0 Installation of New Filter/Cartridge

At the start of a new sampling cycle, a new filter and cartridge should be installed. The monthly site protocol lists the dates for installation and sampling.

4.1. Glass Fiber Filter Installation

4.1.1 Place on a pair of latex gloves. Within the enclosure, unwrap the aluminum foil from a pre-weighed filter and place it in the filter holder, *numbered side facing up*. Save the aluminum foil in a plastic bag.

4.1.2 Close the filter holder by tightening the screw nuts on either side of the holder.

4.1.3 Place the snap-on filter covering over the filter holder for transport to the Hi-vol sampler.

4.1.4 Lift up the sampler hood and the filter cover plate. Remove the snap-on filter covering and place the filter holder into the proper position.

4.1.5 Place the filter holder nuts (1-4) onto the filter holder and tighten diagonally. Place the filter cover plate over the filter holder and close the sampler hood.

4.2 XAD-2 Cartridge Installation

- 4.2.1 Within the enclosure, open a new resin cartridge sampling tin and unwrap the aluminum foil.
- 4.2.2 Place the XAD-2 cartridge into the cartridge holder with the flange facing down. Transport the cartridge holder to the sampler.
- 4.2.3 At the sampler, open the sampling door, make sure the bottom o-ring is properly seated, and install the cartridge holder, bottom end first, screwing the hand screw nut on the cartridge onto the threaded pump device.
- 4.2.4 Make sure the top o-ring is properly seated. Screw the top of the cartridge holder into place by holding the cartridge holder steady and using the hand screw nut to tighten onto the threaded end of the cartridge holder.
- 4.2.5 Turn on the sampler to check for leaks; record the magnehelic reading two minutes after the motor is running smoothly.

5.0 Setting the Clock and the Timer

Mechanical timer. Turn the timer ring so that the red pointer points to the correct day and time. Position the switch trippers so that the *Silver*-colored tripper is at the start day and time and the *Black* tripper at the end day and time specified in the site protocol. Make sure the thumb screws face out and are hand-tightened so that the trippers are firmly attached to the rim of the ring. Be sure to record the reading on the elapsed time counter.

For samplers with electronic timers refer to Section 8.6.2.

**Appendix A
SAMPLE DATA SHEET**

1. Station Name BRULE RIVER 2. Operator _____

3. Sample Start _____ End _____

Yr Mo Da Time Yr Mo Da Time

4. Sample Type _____ Sample Codes _____
 Precipitation Column UP - - Total Vol: _____ L

TSP/TOC Filter UT - Filter ID _____

Sampler Timer End _____ Magnehelic End _____

Timer Start _____ Magnehelic Start _____

Set-up Date _____, + _____ days

Organics Filter UH - F- Filter ID _____

High Volume Sampler Cartridge UH - C-

Timer End _____ Magnehelic End _____

Timer Start _____ Magnehelic Start _____

Dichot Sampler Codes UD- UD-

Filter IDs: Fine _____ Coarse _____

(T) 1st Timer end _____ Rotameters _____ (C) _____
 start _____

(T) 2nd Timer end _____ Rotameters _____ (C) _____

MIC #2 OPERATION ____ TEMP ____ VOL ____

Sample: Collected ____ Set up ____

METALS AEROCHEM OPERATION ____ TEMP ____

Sample: Collected ____ Set up ____

STANDARD AEROCHEM OPERATION ____

Sample: Collected ____ Set up ____

MET SYSTEM WIND VANE ____ ANEMOMETER ____

PROBLEMS AND GENERAL OBSERVATIONS:

OPERATOR _____