

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division	NUMBER IH88200
	REVISION FINAL Rev1
INDUSTRIAL HYGIENE GROUP Standard Operating Procedure	DATE 05/21/07
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SUBJECT: MIE Fibrous Aerosol Monitor FAM-1	

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1.0 Purpose/Scope

This procedure provides a standardized method for the operation of the MIE Fibrous Aerosol Monitor (FAM-1). It should be used in conjunction with the SBMS Subject Area *Asbestos* and other Asbestos procedures in the IH SOP IH-88 series.

The unit is typically used to supplement (not replace) regulatory specified sampling methods using filter media and calibrated sampling pumps. The FAM-1 provides an indication of ambient, airborne fiber levels of asbestos containing materials (ACM). The FAM-1 is factory calibrated to report results comparable to NIOSH Method 7400 Phase Contrast Microscopy (PCM) for asbestos fiber monitoring. The FAM-1 is used to give a rapid, quantified indication of airborne fibers present in an area after an unplanned event. The information can be used to plan immediate response actions to be taken in the time interval while laboratory analysis on sampling filters is being processed.

The FAM-1 is not a recognized laboratory method for compliance monitoring. It is not specific to asbestos fibers and should not be used for compliance with any regulatory requirement. The meter should be used with professional guidance and subsequent, laboratory analytical verification by PCM.

This meter is used to

- Count individual fibers in real time and calculate average airborne concentrations.
- Determine, along with professional judgment, immediate re-occupancy criteria in emergency response situations.

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2.0 Responsibilities

- 2.1 Use of this SOP shall be limited to persons acting under the direction of a competent hazard assessor who has demonstrated the competency to satisfactorily use the procedures and meter, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization.
- 2.2 Personnel that perform monitoring with this procedure are responsible to follow all steps in this procedure.
- 2.3 The data collected using this meter must have an appropriate evaluation of the hazard and risk by a skilled Industrial Hygiene professional.

3.0 Definitions See also IH SOPs 88--- series

Asbestos Containing Material (ACM) – a material determined by laboratory analysis to contain greater than 1% asbestos fibers.

Fiber - a particulate 5 micrometers or longer, with a length-to-diameter ratio (aspect ratio) of at least 3 to 1.

Regulated area - means an area established by the employer to demarcate areas where airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limits.

Clearance level standard: air airborne concentrations results for post-abatement samples are to be less than 0.01 asbestos fibers per cubic centimeter of air.

4.0 Prerequisites

4.1 **Training prior to using this meter:**

- 4.1.1 Demonstration of proper operation of the instrument to the satisfaction of the employee's supervision and *EPA certified class* as determined in Section 7.
- 4.1.2 Review of the SBMS Subject Area *Asbestos*.

4.2 **Area Access:**

- 4.2.1 Contact the appropriate Facility Support Representative or FS Technician to obtain approval to enter radiological areas. Complete appropriate training for the area to be entered.
- 4.2.2 Verify with the appropriate Facility Support Representative or FS Technician if a Work Permit or Radiological Permit is needed or is in effect.

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- If so, review and sign the permit.
- 4.2.3 Use appropriate PPE for area.

5.0 Precautions

Hazard Determination:

- 5.1 The operation of an area survey meter does not create exposure to any chemical, physical, or radiological hazards. The meters do not generate hazardous waste. The meter design does not cause significant ergonomic concerns in routine use.
- 5.2 This meter contains a 2-milliwatt helium-neon laser with a wavelength of 632.8 nm. The laser is enclosed, interlocked and labeled. Users are not to open the bottom half of the case for any reason.
- 5.3 The unit is used in areas suspected of having potentially, high airborne asbestos fiber concentrations. The primary hazards from asbestos exposure are: lung scarring, cancer, and mesothelioma.
- 5.4 Consult Job Risk assessment [IH-JRA-05](#) for additional risk and control measure evaluation.

Personal Protective Equipment:

- 5.5 When used in a regulated area, engineering controls (HEPA ventilation) and PPE, (fiber impervious body covering and respiratory protection) must be utilized.
- 5.6 Other appropriate PPE for hands, feet, skin, head, or eyes for non-asbestos hazards may be needed for the area being entered. Check with the area FS Representative.

6.0 Procedure

The FAM-1 components are inside a carry-case and include:

- The sampling cassette (25 mm MCE with conductive cowl).
- The electrical cord.
- The flow meter.
- The meter body.

Specific Instrument Precautions

- The meter is sensitive and can be misaligned due to physical shock (rough handling or dropping).
- High dust levels and or relative humidity may affect the reported result as well as adversely affect future operation of the instrument.

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- If exposed to low temperatures (e.g. in the trunk of a car during winter) allow the unit to return to room temperature prior to turning the unit on. Otherwise water vapor may condense on the interior surfaces causing voltage leakage affecting either temporary or permanent operation.
- The inlet of the FAM should be placed in a central location with respect to the area to be assessed, away from strong localized air currents due to fans, blowers, pumps, ventilation intakes/exhausts, etc.
- The FAM should be placed on a firm support without excessive vibration.
- Tubing may be attached to the inlet end of the FAM to extend sampling positions. However, only Tygon® tubing (not Teflon) should be used and not exceed 6 feet. The tubing inlet should point either horizontally or downward to prevent debris from entering.
- Exposure to water spray or any other liquid must be avoided.
- There are two overload indicator lights. These may come on periodically during sampling but are not a problem unless this condition arises frequently.
- For areas with high dust operations, the unit should not be shut off during sampling. At the end of the sampling and prior to turning the unit off, a filter may be placed on the FAM inlet to clear the instrument before shutting it down.

Operating instructions

6.1 **Calibration:** No external calibration is required prior to sampling. The meter can only be factory calibrated. Follow IH51660 for calibration frequency.

6.2 **Set-up:** Open the case and remove the power cord from the top half of the case. Remove the top half of the case and set aside(hinges slide for removal). Most of the optional settings will be set by the IH lab technician.



6.2.1 Securely plug the line cord into the back of the raised control panel and into an 110V wall outlet. Use of an extension cord is allowable within SBMS guidelines for their use.

6.2.2 Remove the red protective cap from the meter's air inlet.



6.2.3 Locate and remove the transparent flow meter which is fastened to the unit.

6.2.4 Push this unit snugly down over the receptacle as indicated in the drawings



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(Attachment 9.1). Ensure the connection is tight.

6.2.5 Remove the plugs from the ends of a sample cassette and plug the flow meter tubing into the outlet side of the cassette (small end). Push the inlet end (large end) of the cassette onto the fitting adjacent to the flow meter. Ensure the connections are tight. The sampling cassette is not used for laboratory analysis.

6.3 Select the Sample Time using the Sample Time switch. Note the longer a sample runs the more precise (significant figures) the sample results. A 10 minute sample will result in two significant figures (0.00).



6.4 Complete the routine diagnostic checks prior to sampling. See section 6.4.

6.4.1 Turn the edgewise meter selector switch to Laser Alignment.

6.5 Switch the Power to On and push the Sample Mode switch momentarily to Start/Reset (up) and release. This begins a sample in single sample mode.



6.6 To sample continuously push the switch to the continuous position (down). The flow meter will read approximately 2 liters/minute and the digital display should read C 0.00. The numbers may change during sampling as this represents the total number of fibers counted and not the final average air concentration.

6.7 Recording readings:

6.7.1 No data logging capability is used with this instrument. Each data point needs to be individually recorded.

6.7.2 In single sample mode the unit will stop sampling after the selected time period and display the result on the readout. Record this result on the *Direct Reading Sampling Instrument* form, or equivalent.

6.7.3 When sampling in continuous mode, the result will only appear for approximately 12 seconds. The unit will then start a new sample and delete the previous result. Thus, the meter must be observed carefully near

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the end of the sampling period and each sample must be recorded on the sampling form within that 12 second time period.

6.7.4 For the last sample in continuous sample mode, push the *Start/Reset* switch to single sample mode (center position). The instrument will complete the run underway and then stop, displaying the last concentration reading.

6.8 **Ending Sampling:** Turn the power off at the switch on the meter.

6.8.1 Remove the sample cassette from the flow meter and recap both ends. The sample cassette may be used again as long as it does not restrict flow and is in good condition.

6.8.2 Remove the flow meter and screw down onto the unit from where it was removed.

6.8.3 Place the red protective end cap back onto the unit's air inlet.

6.8.4 Remove the power line cord and rewind onto the holder in the top of the case.

6.8.5 Wipe off the unit to ensure it is in clean condition prior to removing from the site.

6.8.6 Attach the top of the case, close and return the unit to the IH lab.

6.8.7 Check the meter back into the lab using the Check In/Out software.

6.9 **Calculations and determination of anticipated exposure levels/re-occupancy criteria:** (Do not use this meter for determining acceptable levels for personal exposures. That type of sampling is based on laboratory analysis of compliance samples (ACGIH TLV and the OSHA PEL/excursion limit)). This meter can be used to determine re-occupancy criteria based on acceptable levels as determined by the EPA/NYS asbestos project clearance level. The result displays in units of fibers per cubic centimeter of air (f/cc). Criteria level for re-occupancy of a space after asbestos clean-up is **0.01 f/cc**.

6.9.1 All results should be reviewed and interpreted by an IH professional trained in asbestos exposure evaluations.

6.9.2 All FAM-1 data should be supplemented with a fiber collected sample.

6.9.3 Prepare a hazard evaluation report written by a competent person on the survey and ensure a copy is sent to the IH Laboratory and the department ESH coordinator.

6.10 Enter the monitoring data into the BNL exposure database as per IH60500.

6.11 **Routine Diagnostic Checks** (performed by the IH lab, as needed.)

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The following sequence of checks should be conducted in a clean environment or connecting a low pressure drop, high efficiency filter (e.g. glass fiber) to the FAM-1 inlet. These checks are recommended by the manufacturer prior to each use.

- Set Ratio control is adjusted to 5.0
- Set Amplitude control to 0.50 and locked.
- Set Discrimination Mode selector switch in *Ratio Plus Amplitude* position (up).
- Set Sample Mode selector switch in *Single* position (middle).
- Plug line cord into AC outlet.
- Switch Power to *On* and select 10 minute Sampling Time.
- Push *Sampling Mode* switch momentarily to *Start/.Reset* (up) and release. Then place this switch in *Continuous* position (down).
- Observe the flow meter ball. Center of ball should be at 2 lpm when viewed horizontally. If the flow meter readings differ from 2 lpm unlock the Flow Adjust control (push up small side lever) and adjust control until flow meter indicates 2 lpm. Lock control pushing down small side lever.
- Plug inlet opening with finger and the flow meter should drop below lowest marking (pump may stop running). Unplug inlet and reading should return to 2 lpm.
- Set selector switch to *Laser Alignment* position. Observe meter. Reading should be between 4.5 and 5.5 volts. Typically 5.0 volts.
- Move meter selector to *Avg Fiber Signal* position and reading should be less than 0.2 volts.
- Move selector switch to *Top Scatter* position. Reading should be less than 0.2 volts.
- Move the selector to *Field* position. Reading should be between 4.0-4.5 volts. Typically 4.3 volts.
- Move the selector switch to *Battery* position (this reading indicates the internal battery condition). Reading should be between 10 and 14 volts. Typically 11.0 volts. Note: the scale is 0-20 for this test, which doubles the observed reading.
- Place Sample Mode switch to *Single* and wait until the FAM-1 stops operation at end of 10 minute period. Indicated fiber concentration should not exceed 0.01 f/cc. This will complete the calibration checks and warm up period.

7.0 Implementation & Training

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- 7.1 Use of this SOP is limited to:
- 7.1.1 Persons who act under the direction of a competent hazard assessment person.
 - 7.1.2 Persons who have demonstrated the competency to satisfactorily use the procedures and meter, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization.
 - 7.1.3 Persons who have completed an EPA certified *Asbestos Inspector or supervisor* course.
- 7.2 For the SHSD IH Group personnel:
- 7.2.1 Qualification on this Job Performance Measure (JPM) is required on a 3 year basis.
 - 7.2.2 Personnel are to document their training using Attachment 9.3 *Practitioners Qualification Form*.
- 7.3 Training for entry into restricted areas may be required (check with ESH coordinator or FS Representative for the facility).

8.0 References

- 8.1 ACGIH Documentation of TLVs. American Conference of Governmental Industrial Hygienists.
- 8.2 EPA Asbestos Hazard Emergency Response Act (40 CFR Part 763).
- 8.3 SBMS Subject Area *Asbestos*.
- 8.4 MIE Model FAM-1 User's Manual copyright April 1989.

9.0 Attachments

- 9.1 Photos of FAM-1
- 9.2 Abbreviated Instructions
- 9.3 Practitioner Qualification Form

10.0 Documentation

The only official copy is on-line at the SHSD IH Group website.
 Before using a printed copy, verify that it is current by checking the document issue date on the website.

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Document Development and Revision Control Tracking		
Prepared By: <i>(signature/date on file)</i> J. Peters 08/08/05 Certified Industrial Hygienist	Reviewed By / Date: <i>(signature/date on file)</i> R. Selvey 08/23/05 Certified Industrial Hygienist	Approved By / Date: <i>(signature/date on file)</i> R. Selvey 08/23/05 Industrial Hygienist Group Leader
ESH Coordinator/ Date: <i>None</i>	Work Coordinator/ Date: <i>none</i>	SHSD Manager / Date <i>none</i>
QA Representative / Date: <i>None</i>	Training Coordinator / Date: <i>none</i>	Filing Code: IH50.05
Facility Support Rep. / Date: <i>None</i>	Environ. Compliance Rep. / Date: <i>none</i>	Effective Date: 08/23/05
ISM Review - Hazard Categorization <input type="checkbox"/> High <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Low/Skill of the craft	Validation: <input type="checkbox"/> Formal Walkthrough <input checked="" type="checkbox"/> Desk Top Review <input type="checkbox"/> SME Review Name / Date: N. Bernholc 7/28/05	IMPLEMENTATION: Training Completed: n/a Procedure posted on Web: 05/21/07 Hard Copy files updated: 05/21/07 Document Control: 05/21/07

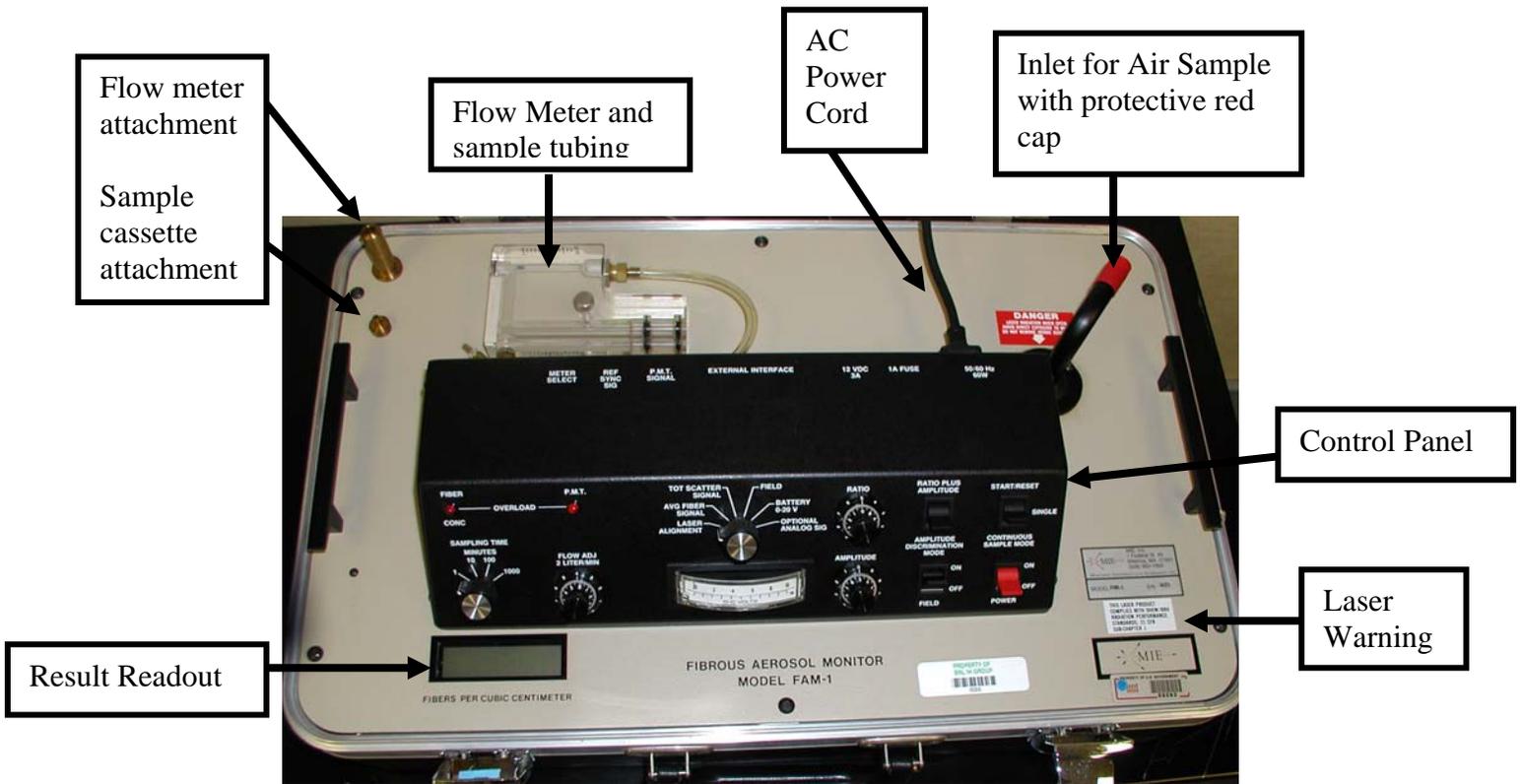
Revision Log		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls		
Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above		
Section/page and Description of change: Review entire document and correct typo errors.		
<i>R. Selvey 05/21/07 (signature on file)</i> SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

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Attachment 9.1a

Photos and Description of the MIE FAM-1 Meter

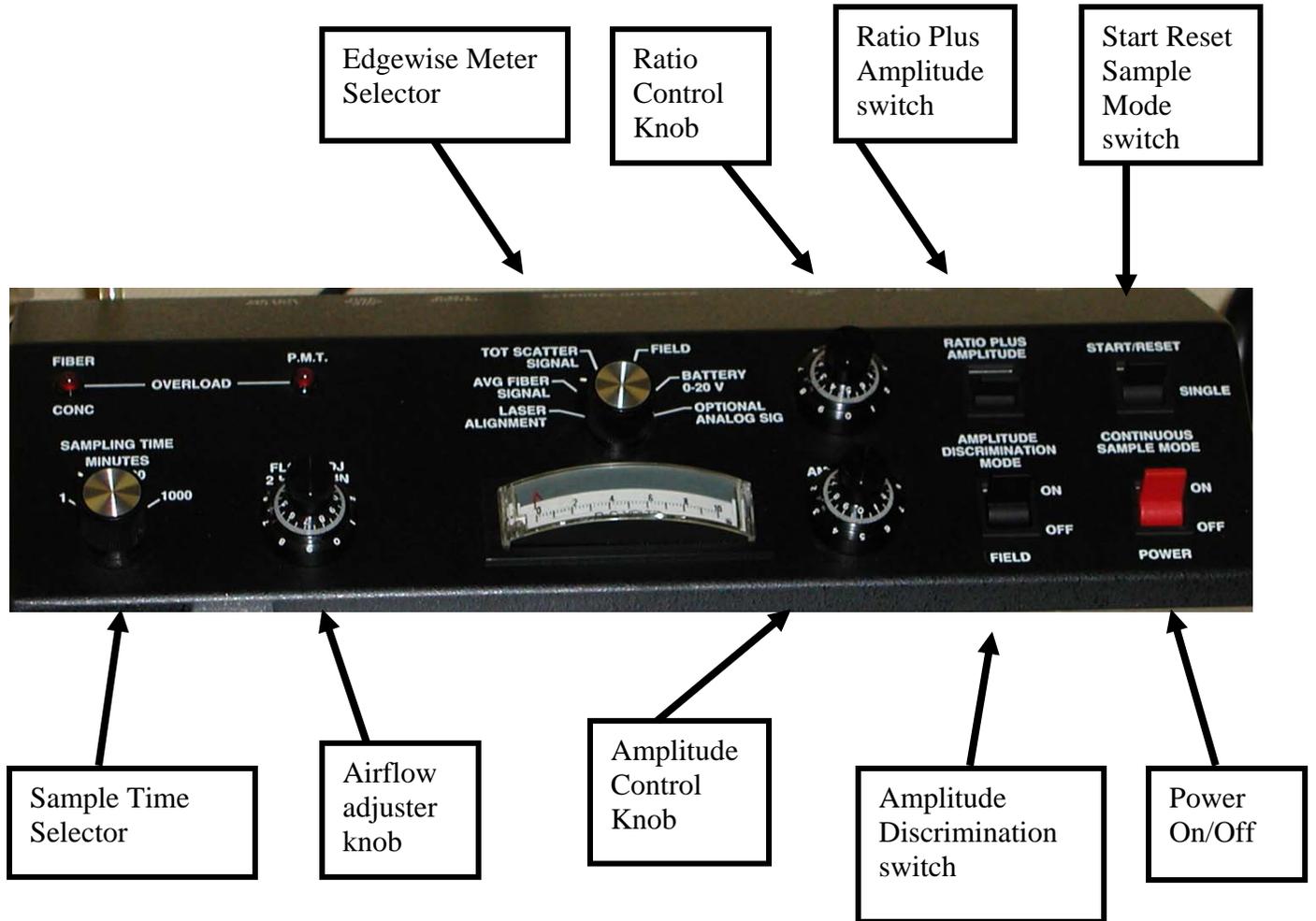


Unit as it first appears upon opening case

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Attachment 9.1b

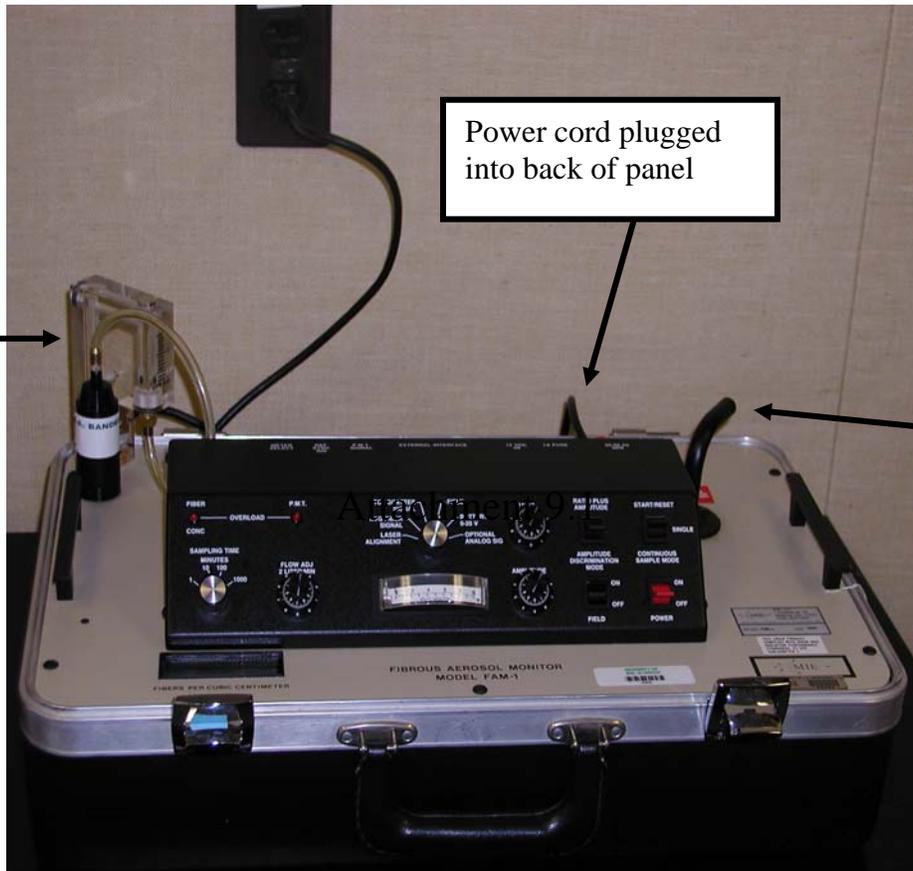


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Attachment 9.1c

Photos of MIE FAM-1



Flow meter and sample cassette attached

Power cord plugged into back of panel

Red protective cap removed from inlet

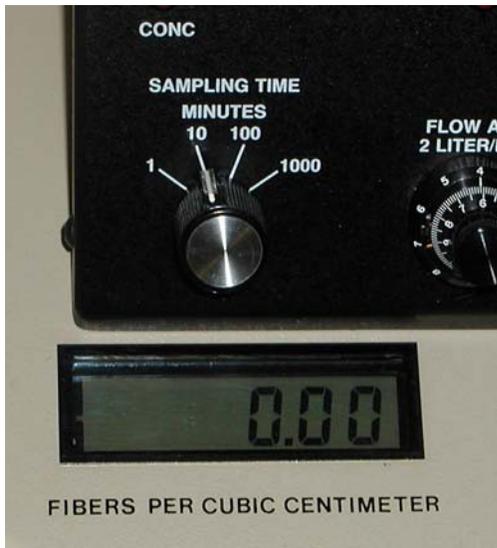
Meter as it appears when set up to sample

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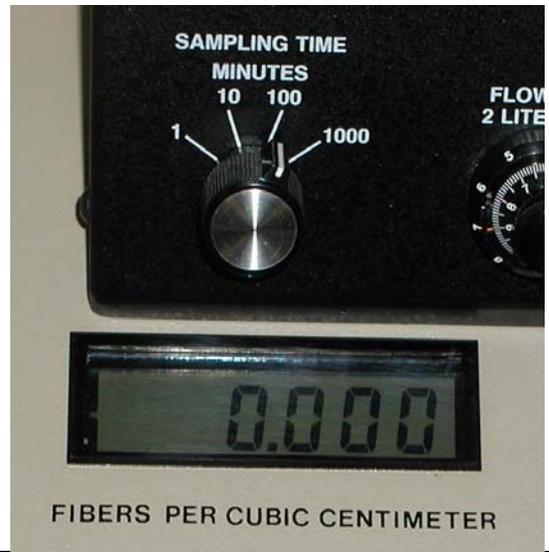
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Attachment 9.1c

MIE FAM-1 Readout



Readout after 10 minute sample event
NOTE: decimal appears with two significant figures



Readout after 100 minute sample event
NOTE: decimal appears with three significant figures



Readout during sample event
Note: C means counting

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Attachment 9.2

MIE FAM-1 Abbreviated Instructions

- 1.1 Open cover and unwrap power line cord
- 1.2 Check that line cord is securely plugged into receptacle on back of raised control panel.
- 1.3 Remove transparent plastic flow-meter unit from rear of top panel by loosening knurled screw. Plug this unit into brass fitting and filter cassette. Plug filter into receptacle (inlet side down) on left rear of panel. Ensure full insertion of all fittings.
- 1.4 Plug line cord into an AC outlet (115V-60 Hz for standard until).
- 1.5 Conduct routine checks.
- 1.6 Select Sampling Time: typically 10 or 100 minutes.
- 1.7 Turn edgewise meter selector switch to Laser Alignment position.
- 1.8 Amplitude discrimination mode switch should be in the Ratio Plus Amplitude position (up).
- 1.9 Ratio control knob should be set to 5.00.
- 1.10 Switch Power On. Push Sample Mode switch momentarily to Start/Reset (up) and release. Prior to sampling wait approximately 10 minutes for warm-up.
- 1.11 Place Sample Mode switch in Continuous position (down).
- 1.12 Flow meter should read 2 liters/minute. Edgewise meter should read approximately 5. Digital display should read C 00. Note the C means the FAM is counting.
- 1.13 Concentration in fibers/cc will be indicated at the end of each sampling period (e.g. 10 or 100 minutes) for about 12 seconds after which the next sampling period starts automatically (pump runs continuously, without interruption).
- 1.14 To terminate continuous operation switch Sample Mode to Single position (middle). Instrument will complete run underway and then stop, displaying last concentration reading until Power is turned Off.

Safety and Health Services Division - Industrial Hygiene Group

MIE Fibrous Aerosol Monitor FAM-1
Qualification Certificate: Job Performance Measure

Candidate's Name (Print):	BNL#
Qualified By:	Date of Qualification

Practical Skill Evaluation: Demonstration of Principles by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Hazard Analysis	Understands the need to perform a hazard analysis of the area and potential exposure to self as sampler and workers in the area. Understands special hazards presented by the meter.			
2. Personal Protective Equipment	Understands the need to be aware of the potential surface contamination, airborne levels of contaminants, radiological hazards, and noise hazard. Knows how to determine the need for PPE.			
3. Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
4. Pre-Testing Inspection	Verifies the area to be monitored is ready. Documents conditions of sampling. Understands limitations and special requirements of the sampling meter.			
5. Measurement of hazard	Knows how to properly measure exposure to hazardous levels.			
6. Operating Parameters	Knows the theory to establish operating parameters (safety envelope) for the equipment.			
7. Documentation	Demonstrates correctly filling out IH monitoring forms.			

Practical Skill Evaluation: Demonstration of Methodology

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Determining the need for investigation	Demonstrates knowledge to determine the appropriate assessment parameters.			
2. Conducts appropriate interviews	Demonstrates knowledge in conducting interviews with supervision, the worker and co-workers to determine exposure characteristics.			
3. Conducts hazard assessment	Demonstrates knowledge in conducting appropriate area measurements to determine exposure potential in the work operations.			
4. Documentation	Demonstrates correctly filling out IH forms, transfers appropriate info to IH databases, prepares an evaluation assessment report (including an evaluation of the relationship of the exposure to occupational exposure limits), and notify workers and management of the results.			

Meter Operation Practical Skill Evaluation: Demonstration of Methodology

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
Set-up	Demonstrates how to correctly attach components to the meter and set initial run parameters.			
Logs data Correctly	Demonstrates how to correctly document readings.			
Placement in Work Area	Demonstrates how to correctly place the unit in the work area.			
Operating the meter to record data	Demonstrates how to correctly operate the meter.			
Recording Data	Demonstrates recordkeeping requirements and distribution.			

I accept the responsibility for performing the tasks as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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