

INSTRUCTIONS **FOR AUDITING PM-10(SS) SAMPLERS**

using the
REFERENCE FLOW (ReF) DEVICE

MATERIALS AND ASSEMBLY

A. EPA supplied materials:

- . ReF device
- . Wind deflector
- . One red check plate
- . Collapsible U-tube water manometer
- . Tygon tubing
- . Data forms

B. Participating agency supplied materials:

- . Thermometer: **Report Temperature in degrees centigrade.**
- . Field operating PM-10(SS) sampler with rotameter or pressure transducer
- . Watch
- . Air barometer - Capable of measuring the **uncorrected** barometric pressure (Note: If no barometer is available at the site, barometric pressure may be obtained by calling the nearest U.S. Weather Bureau Office and requesting **STATION PRESSURE** or uncorrected barometric pressure.)
Report barometric pressure in millimeters of mercury (mm Hg).

C. Assembly

1. Open PM-10(SS) sampler shelter and remove face plate and filter from filter cassette.
2. Remove the two guide pins from the base portion of the filter cassette.
3. Tilt the sampler head back as far as possible.
4. Place the base of the filter cassette on the sampler as you would for sampling.
5. Place a clean quartz filter on the filter cassette screen.
6. Position the ReF device over the four guide pins on the sampler and attach with the thumb screws.

NOTE: The wind deflector will not fit on the Ref unless the sampler head

is completely removed. The deflector is not necessary unless it is extremely windy. If that is the case, you may want to perform the audit later.

7. Mount water manometer in a vertical position.
8. Turn the two (2) manometer tubing connectors one turn counter-clockwise. Make sure both connectors are open.
9. Attach one manometer connector to ReF device pressure tap using the supplied tubing (see Figure 1).
10. Adjust manometer midpoint by sliding movable scale until zero point corresponds with the water meniscus. Gently shake or tap the manometer to remove any air bubbles and/or liquid remaining on tubing connectors.

(IF ADDITIONAL LIQUID IS REQUIRED, REMOVE TUBING CONNECTOR AND ADD THE SUPPLIED MANOMETER FLUID)

TEST PROCEDURES

Data Form

1. The complete 9-digit AIRS site code is required for all SLAMS/NAMS sites. The AIRS site code must be recorded in the space provided on the data form.

FOR NON-SLAMs/NAMs SITES: Participants should assign a site number to each NON-SLAMs/NAMs site audited.

2. Record a unique sampler serial # so data can be matched with the exact instrument audited. Space for this number is provided in the upper right corner of the data form.
3. The reporting units for flow are m^3/min **PLEASE NOTE**
(Flow is to be reported in cubic meters per minute).
4. Record uncorrected barometric pressure in millimeters of Hg.
5. Record the orifice number (number is stamped on top of the ReF device).
6. Record date of test.
7. Indicate method code 001 or 002 for the type of sampler being audited.
8. Enter the number "88" in the column labeled "Resistance Plate Number".

ReF - PM-10(SSD) Sampler

1. If you have a manometer permanently mounted at the site, please disconnect it before you perform the leak check.
2. Install the one hole red check plate in the ReF device by opening the lid and placing the check plate in the machined opening. The system can now be checked for leaks by turning on the sampler motor and placing your finger over the hole in the plate. If signs of leakage are evident (leakage can usually be discovered by listening carefully), they must be corrected before proceeding with the test.

CAUTION: This check should be performed within a two-minute period. Any longer could possibly damage the motor.

3. Remove the red check plate. Close and fasten the lid securely.
4. Turn sampler motor on and let it run for five minutes.
5. Record (on the data form) the atmospheric temperature to the nearest one degree centigrade.
6. Record (on a piece of scrap paper):
 - . The observed pressure differential as indicated by the U-tube manometer in inches of water (see Figure 2).
 - . The uncorrected flow measurement as you would normally do for a sample collection.
7. At one minute intervals, record *TWO* additional observations of the pressure differential and the uncorrected air flow measurement.
8. Average the three pressure differential observations and record this average on the data form.
9. Average the flow measurement observations from the rotameter or pressure transducer. Record AMBIENT FLOW measurement on the data form in the proper space. **The flow measurement is obtained from the calibration curve or look-up table for each sampler.**

DO NOT CORRECT ANY OF THE PM-10 (SSD) FLOWS. THEY MUST REMAIN AT THE AMBIENT FLOWS TO CHECK FOR THEIR SET POINT.

DISMANTLING, PACKING AND RETURN

. Manometer

- . Turn manometer fittings clockwise until hand-tight.
- . Replace manometer in plastic zip-loc bag.
- . Replace bag in shipping container.

. ReF Device

- . Remove wind deflector from ReF device.
- . Remove ReF device from hi-vol sampler.
- . Replace ReF device in plastic bag.
- . Repack ReF device, wind deflector, restriction plates, and tygon tubing in shipping container.
- . Fasten straps tightly around shipping container.
- . For specific shipping instructions, see the enclosed letter on yellow paper.

. Data Forms

- . Inspect data forms for completeness. **Incomplete data will not be processed.**
- . Place all data forms into the return envelope provided and mail.

DO NOT RETURN DATA FORMS IN THE SHIPPING CONTAINER WITH THE ReF DEVICE.

Conversion Factors and Sample Calculations

STP Conversion:

$$V_1 = V_2 (P_2 / T_2)(0.3921)$$

Where: V_1 = STP Volume

V_2 = Ambient Volume

P_2 = Ambient Barometric
Pressure in mm Hg

T_2 = Ambient Temperature
in Degrees Kelvin

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1. Inches of Mercury (in. Hg) X 25.4 = Millimeters Hg (mm Hg)
 2. Cubic Feet (ft³) x 0.028316847 = Cubic Meters (m³)
 3. [Degrees Fahrenheit (°F) - 32] / 1.8 = Degrees Centigrade (°C)
 4. Degrees Kelvin (°K) = °C + 273

Example:

After placing the Reference Flow Device (ReF) on your hivol, you determine that the flow is 39.5 ft³/min. The temperature is 58 °F and the barometric pressure is 31.4 inches of mercury.

$$58 \text{ °F} - 32 / 1.8 = 14.44 \text{ °C}$$

$$31.4 \text{ in. Hg} \times 25.4 = 797.56 \text{ mm Hg}$$

$$39.5 \text{ ft}^3/\text{min} \times 0.028316847 = 1.119 \text{ m}^3/\text{min}$$

$$14.44 \text{ °C} + 273 = 287.44 \text{ °K}$$

$$V_1 = 1.119 (797.56 / 287.44)(0.3921)$$

$$V_1 = 1.119 (2.775)(0.3921)$$

$$V_1 = 1.218 \text{ m}^3/\text{min}$$

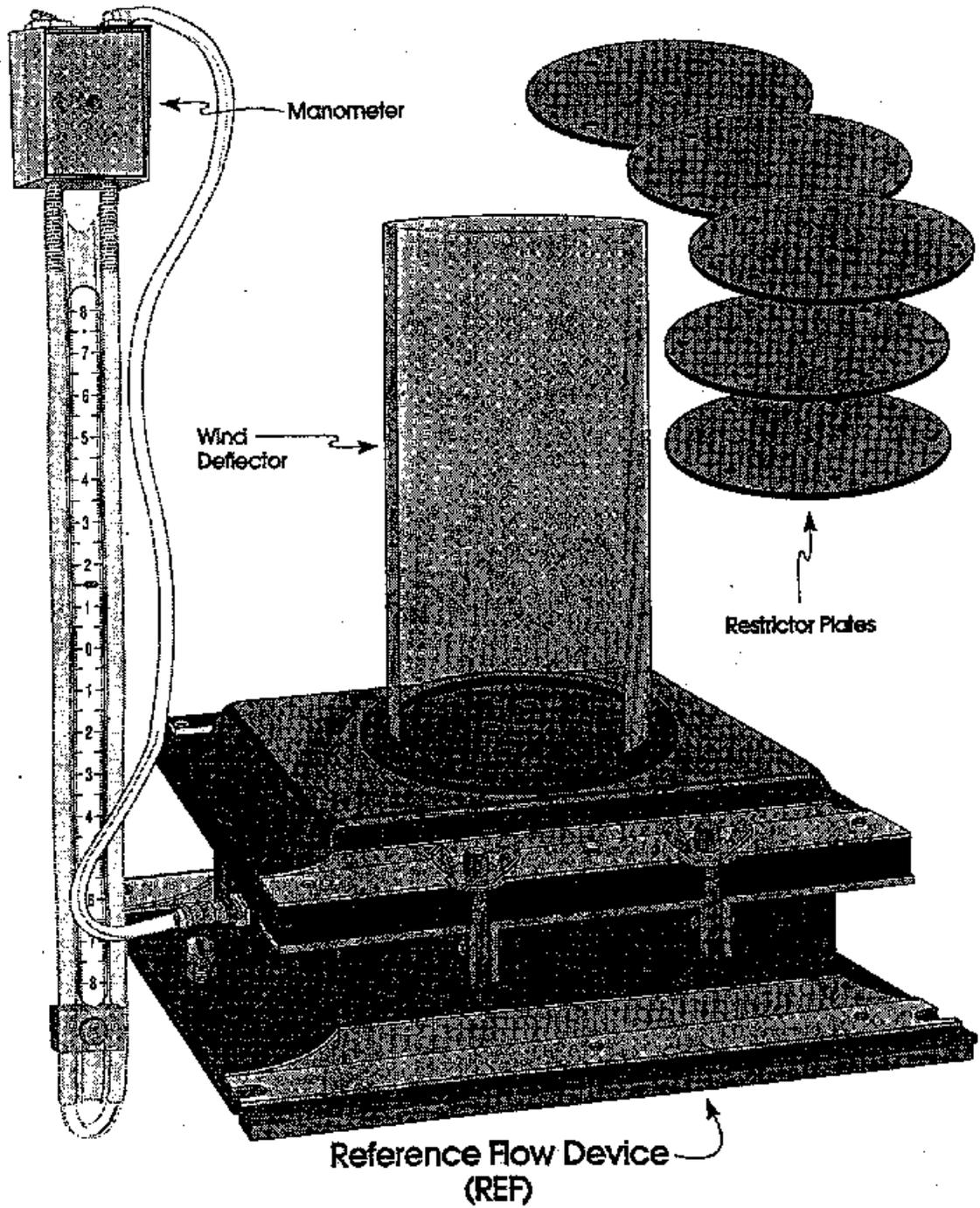
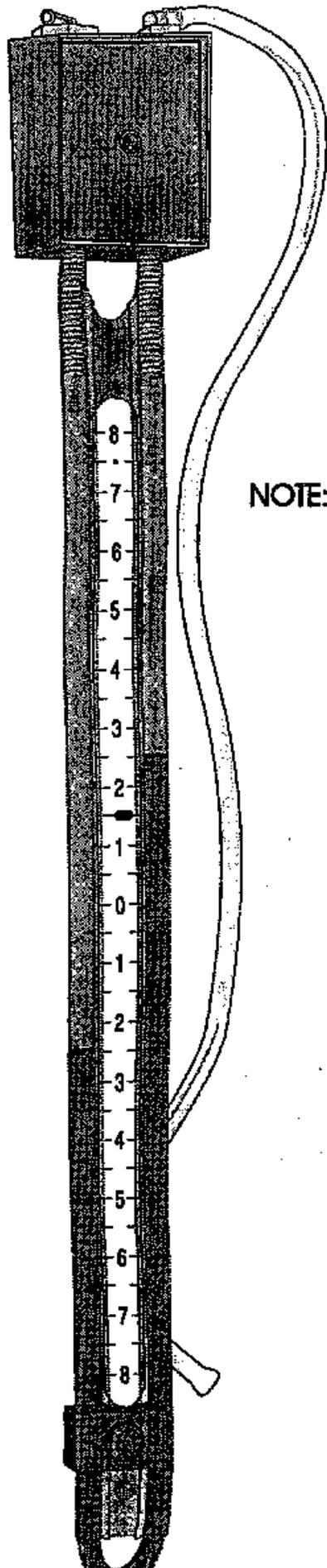


Figure 1



NOTE: Δh is the sum of the differences from zero (0) of the two water column heights.

$$\Delta h = 2 \frac{1}{2} + 2 \frac{1}{2} = 5$$

Figure 2

