

Application Notes:

Auditing the IMPROVE Speciation Sampler Using the Bios Definer 220™ Primary Flow Meter

Introduction

The IMPROVE (Interagency Monitoring of Protected Visual Environments) speciation sampler can be quickly and precisely verified in the field by the hand-portable Bios Definer™ 220 primary flow meter.

The Definer 220 is a primary gas flow meter that performs direct volumetric measurement of gas flow at $\pm 0.75\%$ of reading. Using Bios' patented Proven DryCal® Technology, the Definer 220 measures the time required to displace the piston through a glass cylinder of known volume (accuracy is dimensional, based upon length and time, two of the primary units of measure, or the SI Base Units). As a direct volumetric device, the Definer 220 is not affected by air temperature, barometric pressure, air composition or humidity.

Background

The IMPROVE sampler typically has four filter modules. Each module has critical orifice flow control, a cyclone for removing particles larger than $2.5 \mu\text{m}$, and a cartridge with multiple filter elements. Each filter module should have a nominal inlet flow of 6.7 liters per minute (LPM).

A field flow audit requires the use of the Definer 220 primary flow meter, model 220H (high flow); 3/8" barbed tube fitting (purchased separately, Bios part number 100-411); an 18"-long section of 3/8" flexible tubing; and an adapter for connection to the filter assembly's inlet tee.

The Definer 220 is powered by an internal, rechargeable lead-acid battery, rated for 6 to 8 hours of operation. It does not exhibit memory effect and may be charged continuously. If needed, charge the unit overnight prior to the field audit. Additionally, the Definer 220 has a power-saving Backlight option to enable you to turn the LCD illumination off while the unit is taking flow measurements over an extended period of time (navigate to Setup – Power).

Procedure

- Turn the Definer 220 on by pressing and holding the On/Off button for approximately one second. A "splash screen" will appear, indicating the product name, model number and flow range. Using the arrows on the control panel, navigate to "SETUP" and press ENTER
- Once within the Setup menu, navigate to the "Readings" option. Using the arrows as necessary, verify that it is set to read in volumetric (Vol) flow, and set the number of flow measurements in the average to 10
- Navigate to CONFIRM and press ENTER. The display will flash "Confirmed – New Settings Will be Retained"
- Open the door to the IMPROVE sampler filter module
- Loosen the stack compression sleeve on the sampler tube and raise the tube connecting to the inlet tee inside the filter module housing

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- Insert the adapter into the inlet tee, and connect the 3/8" flexible tubing from the adapter to the fitting labeled "Suction" on the Definer 220 (See Figure 1)
- At the Definer 220's display, navigate to MEASURE and press ENTER. At "Take Measurements" choose "BURST" and press ENTER for a stream of 10 hands-free measurements (based upon the number of flow measurements in the average). The Definer 220 will take 10 consecutive flow readings, and then will stop. Record the average flow reading, and then repeat this procedure for each of the remaining filter modules



Figure 1: Bios Definer 220 connected to IMPROVE Sampler

About Bios

Bios is a recognized leader in primary gas flow measurement. We provide products, services and solutions for professionals in diverse disciplines, including environmental protection, occupational health and safety, industrial process control, research and development and calibration laboratories.

Our Butler, New Jersey facility is one of the world's most accurate gas flow measurement laboratories. Since 2004, we've been accredited to the calibration laboratory quality and proficiency standards set forth by ISO 17025, ANSI Z-540 and NIST Handbook 150, through the National Voluntary Laboratory Accreditation program (**NVLAP**) of the National Institute of Standards and Technology (**NIST**), the national lab of the United States.

We're pleased to state that our **Scope of Accreditation** uncertainty is $\pm 0.071\%$ of reading for gas flow measurements from 5 to 50,000 scc per minute. A current copy of our accreditation certificate and scope may be found on our website, at: <http://www.Biosint.com/pdf/NVLAP-accreditation.pdf>



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