

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division	NUMBER IH75150
	REVISION: Final rev 0
INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	DATE 03/08/01
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SUBJECT: Air Sampling Pump Calibration for the DryCal® DC-1	

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1.0 Purpose & Scope

This document documents a standardized procedure for calibrating air pumps using the DryCal® DC-1 Flow Calibrator. The methodology is based on the procedure described in the DryCal CD-1 Operating Instruction Manual, NIOSH methodology, and established BNL mechanisms for pump calibration and record-keeping.

The DryCal DC-1 was developed to provide an automated technique for calibrating flow measurements of personal and environmental area pumps. This field-portable airflow calibrator utilizes a near-frictionless piston to give either single-reading flow rates or an average of up to ten readings. This method is applicable for sampling equipment with sampling rates in the range of 10 cc/min to 20 liters/min. The typical equipment calibrated by this method is battery operated sampling pumps used for the collection of volatile organic and particulates.

2.0 Responsibilities

- 2.1 Only those personnel who have been trained and have demonstrated competence to the satisfaction of the IH Group Leader in the use of this procedure are authorized to complete air pump calibrations.
- 2.2 Persons using this procedure are responsible to follow all provisions of this procedure.

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3.0 Definitions

- 3.1 *Media*: An assortment of sample devices designed to collect particulate, gases, and vapors into or onto a filter surface, sorbent, or liquid. The most common sampling media include sorbent tubes, filter cassettes, gas sampling bags, cyclones, and impingers.
- 3.2 *In-Line*: Refers to the scenario when sampling medium (such as a filter cassette or sorbent tube cassette) is connected to the sampling device (air-sampling pump) via a piece of flexible tubing.

4.0 Prerequisites

- 4.1 To compensate for sample media resistance and environmental influences on pump flow capacity, sampling pumps with sample media in-line are calibrated before and after use in the field. The policy of the IH group is average of the pre- and post-calibration numbers as the pump capacity. To minimize the effect of pump and meter variability, take a total of at least 6 (six) pre- and post-calibration readings (minimum 3 pre and 3 post readings) to determine the average pump flow rate.
- 4.2 Calibrations should be done as soon before and after sampling as possible, but in all cases within 24 hours of sampling (exception is line voltage powered pumps). Post calibration must be done prior to recharging battery-operated pumps.
- 4.3 To insure that the dry test meter makes accurate measurements, the meter should be calibrated by a NIST traceable source or primary standard annually.

5.0 Precautions

- 5.1 Avoid operating the sampling equipment in excessive chemical or water vapor atmospheres.

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5.2 Air containing cigarette smoke and/or other excessive dust and particulate should be filtered from the DryCal using filters on the entry side of the calibrator.

5.3 **Hazard Determination:** The operation of this test meter in itself does not involve any potential hazards. In the use of the meter to calibrate chemically exposed media, there is a very low potential for exposure to a chemical hazard. The level of exposure does not result in the potential for exposure above occupational exposure limits, but handling of exposed media should be minimized.

5.4 Personal Protective Equipment

5.4.1 Hand: Under normal use, hand protection is not required. Contact with highly contaminated media requires the use of disposable gloves. Exam-style, splash gloves are acceptable. Acceptable elastomers are: Nitrile, PVC, and Natural Rubber.

5.4.2 Body: Under normal use, body protection is not required.

5.4.3 Foot: Under normal use, foot protection is not required.

5.4.4 Respiratory: Under normal use, respiratory protection is not required.

5.4.5 Eye: Safety Glasses with side shields are required.

5.5 **Waste Disposal/ Environmental Impact:** Hazardous Waste is not generated in the use of this meter. This meter has no adverse environmental impact.

6.0 Procedure

6.1 Equipment

6.1.1 Sample Pump (either):

6.1.1.1 High volume air pump for environmental work area sampling (such as the Gast® DOL-101-AA).

6.1.1.2 Personal air-sampling pumps (such as the SKC-224-43XR or the Low flow pump 222-3-Low Flow) for breathing zone sampling.

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- 6.1.2 **Sample Media** (any of these depending on the contaminant)
 - 6.1.1.1 Cassettes (such as 37mm or 25 mm filter media)
 - 6.1.1.2 Various sorbent tubes
 - 6.1.1.3 Culture media for microbial impaction samplers
- 6.1.3 **Tubing** (for connection between the calibrator, sampling media and the pumps). Typical tubing is 0.25" ID PVC (Tygon®) tubing.
- 6.1.4 **Calibrator:** Bios International, Inc. DryCal Model DC-1.

6.2 Calibration Procedure

- 6.2.1 **Preparation of Media and Calibrator**
 - 6.2.1.1 Plug in the DryCal flow calibrator twenty minutes prior to use to ensure that the battery is sufficiently charged.
 - 6.2.1.2 Prior to calibrating any air-sampling pump, verify the operability of all sampling pumps and the DryCal DC-1.
 - 6.2.1.3 Fully charge the pump unit according to the instrument manual.
 - 6.2.1.4 Remove both black inlet and outlet dust caps on cassettes or break off tips of tubes. Remove the end plugs from filter cassettes or break off the ends of glass tubes before attaching to the sampling hose. Use the actual media to be sent to the field.
 - 6.2.1.5 Let the pump run for at least five minutes before calibrating (to stabilize flow rate).
 - 6.2.1.6 Using tubing, attach media end that will be open to the environment directly to the DryCal flow calibrator. See Figure 1.
 - 6.2.1.7 Attach the other end of the sample media, with tubing, to the pump.
- 6.2.2 **Flow measurement with the DryCAL.**
(Done prior to field sampling- PRECALIBRATION)

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6.2.2.1 Automatic Cycle Mode (RECOMMENDED MODE):

To take automatic readings, first press and hold the <MODE> button and then the <READ> button and release simultaneously.

6.2.2.2 Let the calibrator run through a minimum of 3 cycles while in this mode to ensure that the calibrator and pump have stabilized.

6.2.2.3 Record the average from the meter for each 10 readings.

6.2.2.4 Record on the pump calibration log the average flow rates for a minimum of three cycles of 10 reading (See Attachment 1.)

6.2.2.5 To stop the calibrator cycling, push the <MODE> button until the piston stops.

6.2.2.6 Manual Cycle Mode: To take manual readings, press the <READ> button once. A flow measurement reading will appear on the LCD display.

6.2.2.7 Press <READ> again to continue this procedure to obtain the required number of flow readings.

6.2.2.8 All successive readings will automatically be used to calculate the average flow rate.

6.2.2.9 Record on the pump calibration log the average flow rates for a minimum of three cycles of 10 readings (See Attachment 1.)

6.2.3 Send sample media attached to pump, a blank set of media, temperature recording device (for organic vapors) and sample data sheets to the field with the sampler.

**6.3 Flow Measurement with DryCal
(Done after field exposure- Post Calibration)**

6.3.1 Follow the procedures in Step 6.4.

6.4 Handling the sample(s) after Post-Calibration

6.4.1 Remove the sample media from the sample hose and replace end plugs on cassettes or put caps on tubes.

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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- 6.4.2 Place cassettes or tubes in plastic bags and seal with tamper proof tape. Place all paper work with samples. *MAKE COPIES OF ALL PAPERWORK.
- 6.4.3 Follow the SHSD Chain of Custody Procedure to process the sample for analysis.
- 6.4.4 Clean surfaces all pumps and hoses as needed.

6.5 Documentation:

- 6.5.1 Average the pre-calibration and post calibration flow rate values and record on sample form.
- 6.5.2 Document that all battery checks have been done on all personal area sampling pumps.
- 6.5.3 Transfer the average flow rates from the pump calibration log to the appropriate air surveying forms.
- 6.5.4 Maintain the pump Calibration Records for 75 years in the File code IH51QR
- 6.5.5 MAKE COPIES OF ALL PAPERWORK.

7.0 References

- 7.1 DryCal DC-1 Operating Instructions: Primary Air Flow Meters, Form #MANDC1-Word7, Rev. A, 02/05/97

8.0 Attachments

- 8.1 Figure 1: Photo of DryCal Apparatus
- 8.2 DryCal Pump Calibration Record

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9.0 Documentation

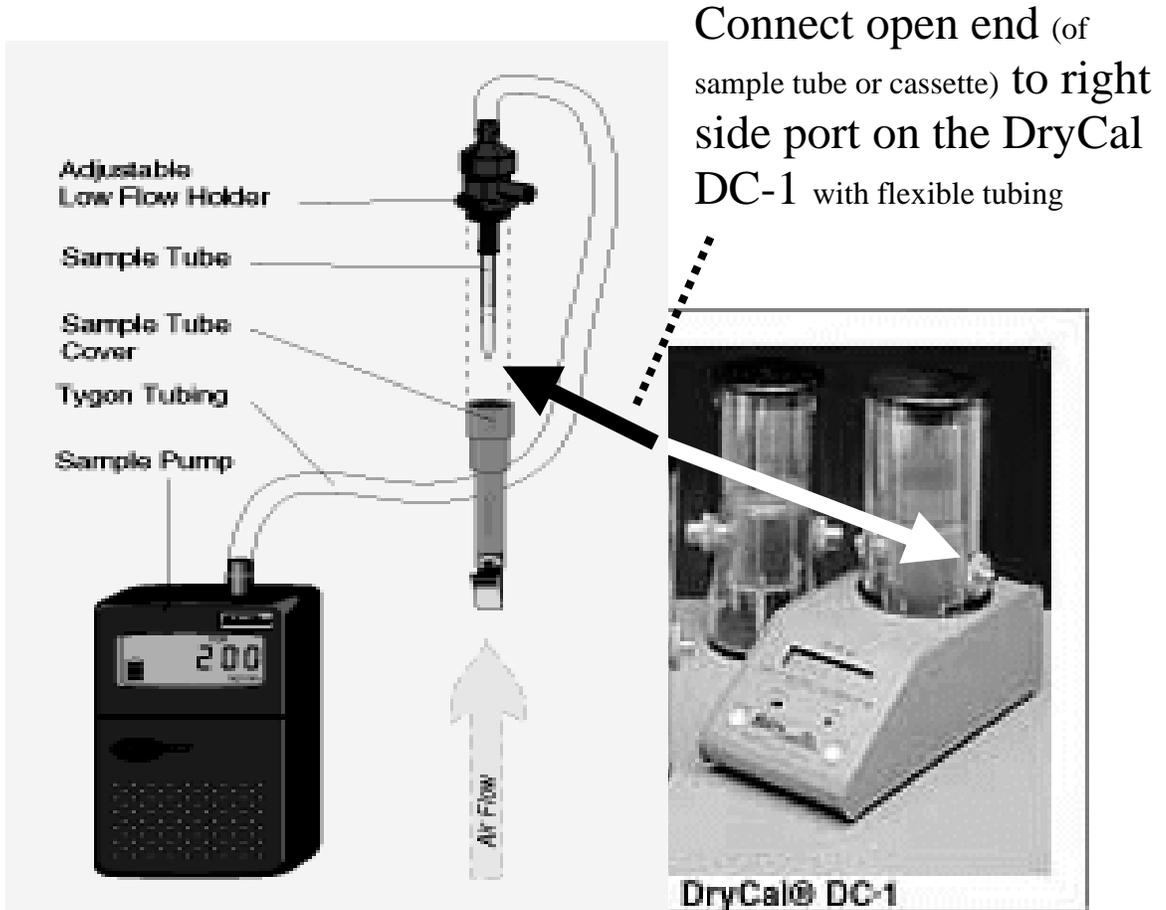
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PREPARED BY: A. Sells Date 07/01/00	REVIEWED BY: <i>(Signature and date on file)</i> R. Wilson IH Lab Date 02/08/01	APPROVED BY: <i>(Signature and date on file)</i> R. Selvey SHSD IH Group Leader Date 02/07/01
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Periodic Review Record		
Date of Review	Reviewer's Signature & Date	Comments Attached
02/07/01	<i>(Signature and date on file)</i> R. Selvey 02/07/01	Revised format and added SBMS header, added PPE, Hazard Assessment sections, overall update of text in all sections.
03/08/01	<i>(Signature and date on file)</i> R. Selvey 03/08/01	Revised SOP number from UH-CP-20.1 to new system IH75150, reviewed text contents, no changes needed.

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Attachment 8.1: FIGURE 1





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DryCal Pump Calibration Record

Record# CAL CY__ - ____

Pump ___SKC-222-3 ___SKC-224-43XR ___SKC 224-44XR ___GAST 101AA Serial#:	Media ID	Pre-exposure			Post-exposure		
		Date	10 Reading Set Average		Date	10 Reading Set Average	
			1	2		1	2
			3	Avg		3	Avg

Pump ___SKC-222-3 ___SKC-224-43XR ___SKC 224-44XR ___GAST 101AA Serial#:	Media ID	Pre-exposure			Post-exposure		
		Date	10 Reading Set Average		Date	10 Reading Set Average	
			1	2		1	2
			3	Avg		3	Avg

Pump ___SKC-222-3 ___SKC-224-43XR ___SKC 224-44XR ___GAST 101AA Serial#:	Media ID	Pre-exposure			Post-exposure		
		Date	10 Reading Set Average		Date	10 Reading Set Average	
			1	2		1	2
			3	Avg		3	Avg

Pump ___SKC-222-3 ___SKC-224-43XR ___SKC 224-44XR ___GAST 101AA Serial#:	Media ID	Pre-exposure			Post-exposure		
		Date	10 Reading Set Average		Date	10 Reading Set Average	
			1	2		1	2
			3	Avg		3	Avg

Pump ___SKC-222-3 ___SKC-224-43XR ___SKC 224-44XR ___GAST 101AA Serial#:	Media ID	Pre-exposure			Post-exposure		
		Date	10 Reading Set Average		Date	10 Reading Set Average	
			1	2		1	2
			3	Avg		3	Avg

Pump ___SKC-222-3 ___SKC-224-43XR ___SKC 224-44XR ___GAST 101AA Serial#:	Media ID	Pre-exposure			Post-exposure		
		Date	10 Reading Set Average		Date	10 Reading Set Average	
			1	2		1	2
			3	Avg		3	Avg

Pump ___SKC-222-3 ___SKC-224-43XR ___SKC 224-44XR ___GAST 101AA Serial#:	Media ID	Pre-exposure			Post-exposure		
		Date	10 Reading Set Average		Date	10 Reading Set Average	
			1	2		1	2
			3	Avg		3	Avg