



Application Guide

Sampling Train — Two Tubes in Series



Sorbent tube sampling is the NIOSH/OSHA-approved method for collecting most hazardous gases and vapors from the air. The sorbent tube is glass with breakable end tips and contains a specially prepared high-activity sorbent. Most tubes have two sections: one for sample collection and the other for backup. This configuration provides a check against saturation of the primary sorbent bed. Some methods specify two separate tubes connected in series. This allows the primary sorbent to be separated from the backup to prevent sample migration during storage and transport. This Application Guide illustrates how to set up a **Sampling Train Using Two Sorbent Tubes Connected in Series**.

Required Equipment

1. An **air sampling pump** capable of sampling at the recommended flow rate with the sampling medium in line, such as:
 - SKC 210 Pocket Pump® with Single Tube Holder Cat. No. 222-3XD1
 - SKC Universal Series Sampler with Adjustable Low Flow Holder Cat. No. 224-26 Series
 - SKC AirChek® 2000 Sampler with Constant Pressure Controller Cat. No. 224-26-CPC and Adjustable Low Flow Holder Cat. No. 224-26 Series
 - SKC AirChek 52 Sampler with Constant Pressure Controller Cat. No. 224-26-CPC and Adjustable Low Flow Holder Cat. No. 224-26 Series
 - SKC AirChek XR5000 Sampler with Constant Pressure Controller Cat. No. 224-26-CPC and Adjustable Low Flow Holder Cat. No. 224-26 Series
2. An **airflow calibrator**, such as:
 - Defender Primary Standard Calibrator 717 Series
3. The **sorbent sample tubes** specified in the method

Optional Equipment

1. SKC **Tube Breaker** Cat. No. 222-3-50 (for 6 and 7- mm OD tubes) or 222-3-51 (for 8 and 10-mm OD tubes)

Introduction

The illustrations in this guide refer to several different types of sampling pumps. If using a Universal Series Sampler, use a low flow holder for sampling flow rates below 1000 ml/min. A low flow holder is not necessary for flow rates greater than 1000 ml/min. If using a low flow Pocket Pump, use a single tube holder. To determine the correct flow

rate for the chemical of interest, refer to the appropriate analytical method. *See the operating instructions for the pump to ensure that it is capable of sampling at the correct flow rate.*

1. Preparing the Sorbent Tubes

Select two appropriate sorbent tubes. These tubes will be used for calibrating the flow and not for collecting the sample. Using a tube breaker, break off both ends of each tube to provide an opening of at least one-half the internal diameter of the tube.

2. Setting Up the Calibration Train with Adjustable Low Flow Holder — See Figure 1

If using a Universal Series Sampler, it is necessary to use an adjustable low flow holder. Ensure that the pump is in the low flow mode. With flexible tubing, connect the adjustable low flow holder to the sampler inlet. Place one sorbent tube into the black rubber sleeve of the low flow holder. The printed arrow on the sorbent tube shows the direction of airflow and should always point toward the tube holder. If there are no arrows on the tubes, insert the end of the tube with the smallest sorbent section (backup section) into the tube holder. Using a short piece of PTFE tubing, connect the second sorbent tube to the first tube so that both tubes are oriented in the same direction.

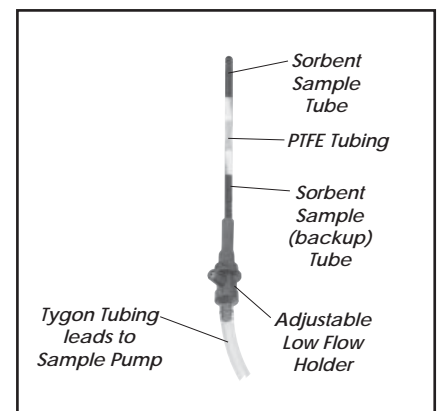


Figure 1. Two tubes in series with adjustable low flow holder

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With Single (non-adjustable) Tube Holder — See Figure 2

Using a low flow pump, connect a single tube holder to the pump inlet with flexible tubing. Place one sorbent tube into the black rubber sleeve of the tube holder. The printed arrow on the sorbent tube shows the direction of airflow and should always point toward the tube holder. If there is no arrow on the tube, insert the end of the tube with the smallest sorbent section (backup section) into the tube holder. Using a short piece of flexible tubing, connect the second sorbent tube to the first tube so that both tubes are oriented in the same direction.

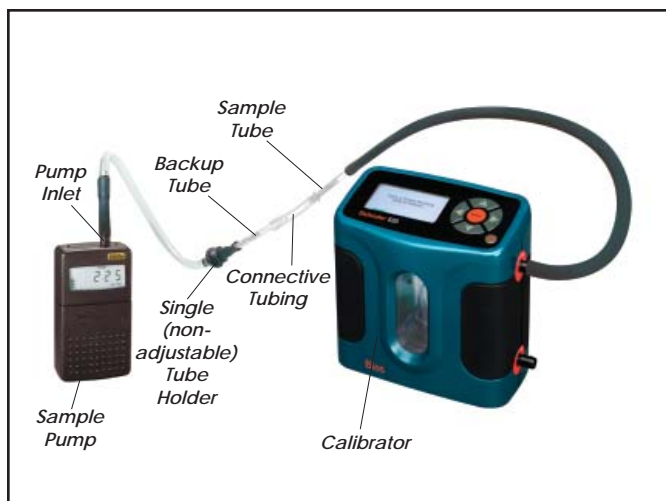


Figure 2. Calibration train using single (non-adjustable) tube holder

3. Calibrating the Flow Rate — See Figure 2

Ensure pump has run for 5 minutes before calibrating. To calibrate the flow rate, connect the exposed end of the outer representative sorbent tube to an external calibrator. Calibrate to the flow rate specified in the analytical method for the chemical of interest. If using an adjustable low flow holder, use the flow adjust screw on the holder to adjust flow rate. Consult the pump and calibrator operating instructions for calibrating the flow rate. When the flow rate has been calibrated and verified, remove the two sorbent tubes used to calibrate the flow and set them aside. These tubes will be used to verify the flow rate after sampling. Record the pre-sample flow rate.

4. Sampling

When ready to start sampling, break off both ends of two new sorbent tubes and connect them in the same manner used to calibrate the flow rate. Insert one sorbent tube into the rubber sleeve of the adjustable low flow holder (or single tube holder) with the smallest sorbent section situated in the tube holder. Using a short piece of flexible tubing (preferably PTFE), connect the second sorbent tube to the first tube so that both tubes are connected in series and oriented in the same direction. In most cases when two tubes are used in series, a protective tube cover does not fit over the tubes. Attach the clip of the adjustable low flow holder or single tube holder to a worker's collar and attach the pump to the worker's belt. The sorbent tubes should be oriented in a vertical direction during sampling. Turn on the pump and record the start time and other sampling information.

5. After Sampling

At the end of the sampling period, turn off the pump and record the ending time. Remove both sorbent tubes, seal the ends of the tubes with the caps provided, and record pertinent sampling information. The leading tube is designated as the sample tube, while the rear tube is the backup tube. Ensure that these tubes are properly labeled.

Using a calibrator, calibrate the flow rate with two representative sorbent tubes in line to verify that the flow has not changed by more than 5%.

Submit field blanks from the same lot number as the sample tubes. Field blanks should be subjected to exactly the same handling as the samples (break, seal, and transport) except that no air is drawn through them.

Pack the sample sorbent tubes, field blanks, and all pertinent information securely for shipment to a laboratory for analysis.

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