

<b>Title: Operation of ACCU System Particulate Matter sampler in Ambient Air in conjunction with the Tapered Element Oscillating Microbalance (TEOM)</b>		
Procedure No: SOP-002	Revision No: 1.0 (January 25, 2011)	Page No.: 1 of 6

## 1. INTRODUCTION AND SCOPE

The ACCU System is an optional Automatic Cartridge Collection Unit apparatus that permits capture of particulate and gaseous samples in conjunction with the operation of the Tapered Element Oscillating Microbalance (TEOM). The TEOM microprocessor controls the ACCU System and permits the operator to schedule timers to control the sampling times. The procedure described in this document is for the operation of the ACCU sampler in conjunction with TEOM operations within the NAPS and AENV networks.

The operating manual supplied by the instrument manufacturer (R&P part no. 42-003347) provides detailed installation and operating procedures. Those procedures are part of this operating method.

## 2. PRINCIPLE OF THE METHOD

The ACCU System added to the series 1400AB TEOM allow manual particulate sampling from the bypass flow line of the TEOM sampler. The user selected flow rate of the bypass line of the TEOM flow splitter (typically 13.67 L/min in Alberta) is carried to the ACCU system and then onward to the auxiliary flow controller in the control unit. Inside the ACCU system a bank of solenoid valves redirects the bypass flow through one of eight sampling devices mounted within the unit. The sampler is able to utilize a range of media which can be fitted for a variety of samplers at user selectable times, frequencies, or selected inputs to trigger a sampling event through the TEOM microprocessor. The following are different selectable samples which can be captured for analysis:

1. Particulate filter holders or pack for a variety of laboratory analysis
2. PUF (polyurethane foam) samplers
3. samples for XRF (X-ray fluorescence) analysis

## 3. MEASUREMENT RANGE AND SENSITIVITY

Not applicable.

<b>Title: Operation of ACCU System Particulate Matter sampler in Ambient Air in conjunction with the Tapered Element Oscillating Microbalance (TEOM)</b>		
Procedure No: SOP-002	Revision No: 1.0 (January 25, 2011)	Page No.: 2 of 6

#### **4. EQUIPMENT AND APPARATUS**

The following models are used in this method.

- Rupprecht & Patashnick (R&P) TEOM Series 1400/1400A including serial number prefixes 1400, 140A, 140AA, 140AB, 140AT, and 140UP.

#### **5. INTERFERENCES**

Sample contamination can interfere with the quality of the measured results. To minimize the possibility of contaminating the sample filter prior to the sampling event, load the sample filter(s) at a time as close as practical to the start of the sampling event. Although the sample cassette(s) may remain in the sampler up to 96 hours (4 days) after the end of the sampling event, remove them from the sampler as soon as practical.

Air leaks in the sample system can affect the measured PM concentrations. Leak checks are done as per the R&P manual. See Section 9.2 below.

#### **6. PRECISION AND ACCURACY**

The measurement precision is generally considered to be the “repeatability of the measurement”. Precision of the data derived from collected samples varies with proper operation of the equipment and filter handling and shipping. These variables can be minimized through consistent and careful sampling practices and a strict maintenance regiment to ensure proper operation of the equipment. See section 9.0 in this document for information on routine maintenance procedures.

The accuracy of the sensor is generally considered the “deviation from true”. This means how close it is to what it should be. The benchmark of “what it should be” is provided by the Alberta Environment Audit Program staff and the use of high quality standards such as available from the National Institute of Standards and Technology (NIST). As with precision, accuracy is maintained through consistent procedures and routine maintenance.

<b>Title: Operation of ACCU System Particulate Matter sampler in Ambient Air in conjunction with the Tapered Element Oscillating Microbalance (TEOM)</b>		
Procedure No: SOP-002	Revision No: 1.0 (January 25, 2011)	Page No.: 3 of 6

**7. INSTALLATION REQUIREMENTS**

The installation procedures of the ACCU System are detailed in the R&P Operating Manual (section 14.2.2). All the steps outlined therein must be followed closely (see TEOM SOP-004). The ACCU system enclosure is electronically attached to the TEOM Auxiliary port connection via a 10 meter cable to provide control signals to activate the various valves. All sampling media are attached via ¼” quick connects. The ACCU system enclosure mounts include 4 bolt tabs for easy wall mounting capability, or an optional support stand can be purchased for mounting purposes.

**8. OPERATIONAL REQUIREMENTS**

The operating parameters of the TEOM are required to be operating as per TEOM SOP-004 and the TEOM operating manual Section 14. The user must predefine the sampling channel and conditions upon which the sample is to trigger. Each channel can contain up to 4 conditions that must be met in order for the sample to initiate. The following are sections of the manual describing the events that can be preprogrammed to initiate a sample

It is important to note that only 1 channel is allowed to sample at a time, and that the user is required to interchange sampling media between sampling events.

The sampling procedures are specified by the manufacturer in the Operating Manual. Comments should include any observations that may affect the interpretation of the results at the sampling location or other helpful information related to the sample taken.

All operational activities conducted at any ambient monitoring station, must be documented in the station logbook, and/or station checklists. This allows other operators to access a history of the station if the regular technician is not available. The following documentation must be available to the operators on site: operational and maintenance manual(s), quality system manual and station site documentation.

**a. Operational Checks**

Maintenance procedures (checks) are designed to help assure that valid data is produced as a result of proper sampler operation and maintenance in accordance with its provincial designation and the manufacturer’s operating manual. The maintenance frequency presented in these standard operating procedures should be considered the minimum required even though the actual frequency of performing some of these checks may vary from site to site due to different environmental factors. These may include the sampling schedule,

<b>Title: Operation of ACCU System Particulate Matter sampler in Ambient Air in conjunction with the Tapered Element Oscillating Microbalance (TEOM)</b>		
Procedure No: SOP-002	Revision No: 1.0 (January 25, 2011)	Page No.: 4 of 6

particulate concentrations, or seasonal factors, which may require an increase in maintenance frequency (CARB, 1999).

#### **b. System Leak Check**

The system leak check should be completed every three months following the manufacturer's instructions laid out in the operating manual. This is done to ensure air is being pulled through the sample inlet only.

#### **c. Programming Modes for Sampling**

##### *ACCU sampling by time of day*

In this mode a collection filter is exposed for a user defined timed period, usually set for specific hours of the day, within one-24 hour period.

##### *ACCU sampling by Specific time/date*

Similar to the first sampling structure, but the command start and stop periods include specified dates to allow extended sampling periods.

##### *ACCU sampling by Concentration level*

The operator can specify an active channel to initiate at pre-determined measured concentration levels of the TEOM. The channel will become active in response to TEOM measurements exceeding the pre-determined level.

##### *Episodic sampling*

In this mode the operator must define two or more consecutive ACCU channels in an identical manner. The sampling is initiated through the use of a special code.

##### *Time sampling*

The sampler can be configured to sample each ACCU channel for predefined periods of time after a specific set of conditions is met and sampled on channel 1.

##### *Sequential sampling*

The sampling configuration can be setup to sample on certain channels for a predetermined amount of time, and then later return to the same channels and sample again for the same amount of time.

#### **d. Sample Filter Change**

Upon initial operation or after a sampling event has occurred, the sample should be replaced. The filter cartridges designed for the ACCU system utilize universal filter cartridge fittings. Refer to section 14.3 of the TEOM manual for detailed instructions. Ensure that the o-ring seal on the universal connectors are clean and free of cracks or degradation.

<b>Title: Operation of ACCU System Particulate Matter sampler in Ambient Air in conjunction with the Tapered Element Oscillating Microbalance (TEOM)</b>		
Procedure No: SOP-002	Revision No: 1.0 (January 25, 2011)	Page No.: 5 of 6

#### **e. Shipping Sample Filters**

Samples must be shipped in the original connector seals they came with and with the filter number visible (not covered over). The log sheet must also accompany the sample filter back to the contracted lab. If samples are shipped in a cardboard container use bubble packing or other shock absorbing material and pack around the samples on all sides. Using “this side up” stickers on the carton may help in proper handling by the shipping company. If samples are shipped in an envelope, bubble insulated envelopes are recommended to protect the samples. A copy of the log sheet will also be faxed to AENV Monitoring Division. Always ship filter/s back to the contracted lab as soon as possible after sampling is completed (AENV, 2002).

#### **f. Blank Samples**

Record the filter identification number located on the plastic container that the filter came in into the “Comments portion of the log sheet”. Also indicate that the sample is a blank sample in the “Comments portion of the log sheet”.

#### **g. Data Collection and Management**

The ACCU System screen can be viewed from the TEOM. Section 14.5 of the TEOM manual describes how to display the information, the first three of which should be recorded with individual samples for laboratory submission. The ACCU System screen displays the following information:

1. the ACCU channel utilized for the sampling event
2. the time (in seconds) which the ACCU channel had been exposed to the sample stream
3. the total volume of air sampled (cubic meters)
4. the current channel actively sampling

If the pressure drop across the installed filter cartridge forced the set flow rate out by +/- 0.4 L/min, the system will stop utilizing that sample channel until the channel is reset. The data will indicate a negative number in the volume field of the ACCU data screen to indicate a failed sample.

### **9. OPERATIONAL REQUIREMENTS**

Refer to TEOM SOP-004 for operational requirements.

<b>Title: Operation of ACCU System Particulate Matter sampler in Ambient Air in conjunction with the Tapered Element Oscillating Microbalance (TEOM)</b>		
Procedure No: SOP-002	Revision No: 1.0 (January 25, 2011)	Page No.: 6 of 6

## 10. CALIBRATION

The sampler accuracy is entirely dependent on the operation and maintenance of the TEOM. Refer to TEOM SOP-004 for analyzer calibration requirements.

## 11. APPLICABLE DOCUMENTS

- **EM-002a** Operating Manual, TEOM Series 1400a, Ambient Particulate (PM-10) Monitor, (AB serial numbers), revision B, R&P Part Number 42-003347, March 2002.

## 12. LITERATURE REFERENCES

Operating Manual, TEOM Series 1400a, Ambient Particulate (PM-10) Monitor, (AB serial numbers), revision B, R&P Part Number 42-003347, March 2002.

## 13. REVISION HISTORY

- 13.1 Revision 0 (new document)
- 13.2 Revision 1.0
  - 13.2.1 Updated Branch Name
  - 13.2.2 Changed Team Leader to Manager

## 14. APPROVAL



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**Approved by:** Harry Benders  
**Title:** Manager

**Date:** January 25, 2011