Procedures Manual for PM-10 Monitoring

Anchorage Environmental Quality Program

Municipality of Anchorage
Department of Health and Human Services
Environmental Services Division
825 L Street, Suite 502
Anchorage, Alaska 99501

December 2005

Procedure Plan Acknowledgement and Approval

Title: ***Procedures Manual for PM-10 Monitoring***

This manual documents the standard operating procedures of the Anchorage Air Pollution Control Agency (AAPCA) for ambient PM-10 monitoring. The Procedures Manual for PM-10 monitoring is hereby recommended for approval and commits the Anchorage Environmental Quality Program to follow the elements described within.

Municipality of Anchorage, Environmental Services Division, Environmental Quality Section

1) Signature: _____ Date: _____

Stephen S. Morris
Environmental Quality Program Manager

2) Signature: _____ Date: _____

Larry Taylor
Quality Assurance Officer

3) Signature: _____ Date: _____

Matthew Stichick
Air Quality Specialist

4) Signature: _____ Date: _____

Chris Salerno
Air Quality Specialist

5) Signature: _____ Date: _____

Anne Schlapia
Air Quality Specialist

6) Signature: _____ Date: _____

Stacey Cooper
Air Quality Specialist

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1 INTRODUCTION

This document describes the procedures the Anchorage Air Pollution Control Agency (AAPCA) uses to sample PM-10 (particulate matter that has an aerodynamic diameter of 10 micrometers or less). The AAPCA uses the General Metal Works (GMW) Model Accu-Vol® IP-10 PM-10 High Volume Sampling System with a Model G1200 PM-10 Size Selective Inlet (SSI) to measure ambient PM-10 (Figure 1-1). This equipment meets Federal Reference Method (FRM) performance specifications for the measurement of PM-10.

This section of the Quality Assurance Manual covers the operation and maintenance of the GMW High Volume Sampling System. This document is intended to be used together with the sampler-specific information and instructions provided by the manufacturer.

1.1 Monitoring Network

There are currently three PM-10 monitoring sites in the Municipality of Anchorage. The sites are selected to monitor for compliance, to build an air quality data base, and to investigate pollution trends. There are three site designations: National Air Monitoring Site (NAMS), State and Local Air Monitoring Site (SLAMS), and Special Purpose Monitor (SPM). The sites include:

1. Tudor, Site #44 (SPM), Allstate roof, 3335 Tudor Road, East Midtown, high traffic area (Figure 1-1, bottom photo).

2. Garden, Site #18 (SLAM), church roof, 16th Street and Garden Street, East Anchorage, residential area.

3. Parkgate, Site #4 (SLAM), Parkgate Building roof, 11723 Old Glen Highway, Eagle River.

1.2 Sampling Frequency

Table 1-1. PM-10 Sampling Sites and Sampling Frequency.

Site	**Number of Samplers**	**Sampling Frequency**
Tudor	3	Every other day
Garden	1	Every sixth day
Parkgate	1	Every sixth day

Figure 1-1. GMW PM-10 High Volume Sampling Systems

1.3 Overview of Operation

The sampler consists of a mass flow controller, a 0.6 horsepower motor, a seven-day mechanical timer, an elapsed time indicator, and a manometer all mounted to the housing of the sampling unit (Figure 1-1). Suspended particles in the air are sampled at a constant flow rate of 40 cubic feet per minute (cfm)(1.13 m^3 / minute). Once air is drawn into the circular SSI, particulate matter are accelerated through nine circular acceleration nozzles. Due to their larger momentum, particles greater than 10 µm in aerodynamic diameter impact onto a greased impaction shim while particulate less than 10 µm are carried upward by the air flow and down 16 vent tubes to an 8 x 10-inch quartz fiber filter where they are collected over a 24-hour sampling period. The 24-hour quartz fiber filters are weighed in the laboratory both before deployment and after sampling. Filters are weighed to four decimal places with a Mettler AE-100 balance. The scale is calibrated each day before use and calibrated professionally once per year. Gravimetric analysis is conducted, and through a series of calculations, mass loading (g), volume of air (m^3) and PM-10 (µg / m^3) are recorded.

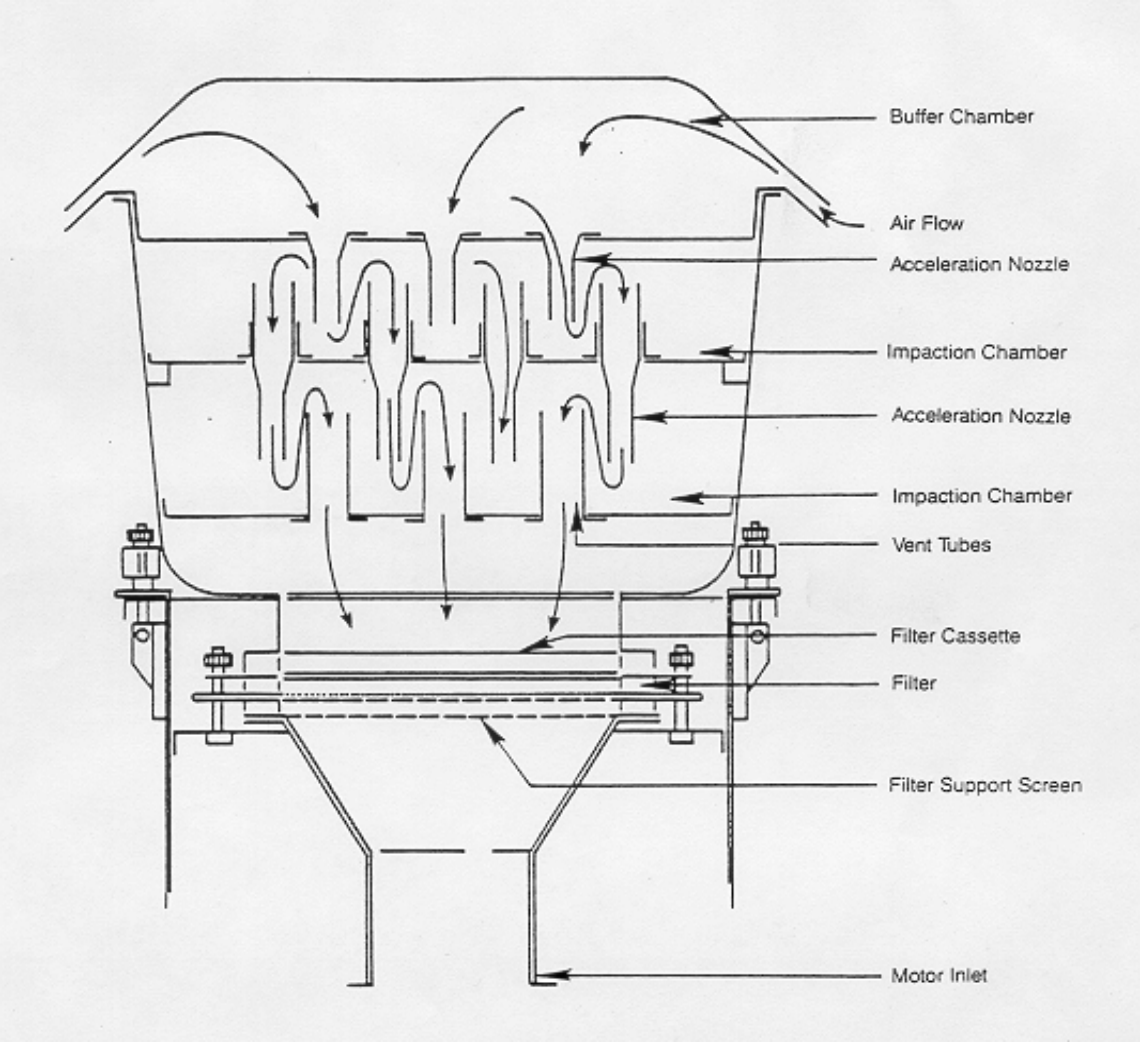

Figure 1-2. Schematic Diagram of an Impaction Inlet (EPA, 1989).

2 EQUIPMENT AND SUPPLIES

- The GMW PM-10 High Volume Sampler System
- Additional sampler parts and supplies including additional gaskets/seals.
- Personal computer
- Analytical balance capable of weighing to an accuracy of four decimal places.
- Laboratory barometer and digital thermometer.
- Calibration equipment as defined in Section 3.0.
- Periodic maintenance equipment as defined in Section 7.0.
- Miscellaneous hand tools, flat screwdriver, soft brushes, calculator, Kimwipes®, paper towels, and worksheets.
- Logbooks and forms (Appendix I).

3 CALIBRATION PROCEDURES

This section describes the procedures involved in calibration of the GMW PM-10 High Volume Sampler System. Because PM-10 concentration standards are not available for determining calibration relationships, individual components of the sampling method must be calibrated to ensure the integrity of reported data. The PM-10 sampler pulls a sample of air through a filter during a measured time period and collects particulate mass on a filter. Therefore, three independent determinations must be made to establish PM-10 concentrations: air volume flow rate, sampling time, and particulate mass.

3.1 Discussion of Flow-Rate Measurement and General Aspects of Calibration

A high volume PM-10 sampler consists of two main components: an inlet and a flow-rate controlling system. The particle size discrimination characteristics of the circular impaction inlet depends on maintaining specific air velocities within the inlet. A change in air velocity will result in a change in the particle size collected. Therefore, the flow rate through the inlet must be maintained at a constant value that is as close as possible to the inlet's design flow rate. The design flow rate for the GMW PM-10 High Volume Sampler System is 1.13 m^3/min. The tolerance limits as specified in the Federal Reference Method for the Determination of Particulate Matter as PM-10 are ±10 percent. Hence, acceptable flow rates for GMW PM-10 High Volume Sampler System must be between 1.02 and 1.24 m^3/min.

3.2 Basic Calibration Procedure for a GMW PM-10 High Volume Sampler

3.2.1 Equipment Needed

- Gray metal notebook from the desk in the lab and PM-10 MOA Air Quality Mass Flow Controller Sampler Field Calibration Sheets (Appendix I)
- A thermometer capable of accurately measuring temperature over the range of -30 to 50°C (243°K to 323°K) to the nearest ± 0.1°C and referenced to a National Institute of Standards and Testing (NIST) thermometer within ± 0.5 °C at least annually.
- A portable ultimeter (calibrated once per year at Inter-mountain Labs) capable of accurately measuring ambient barometric pressure within ± 1 mm Hg resolution and referenced within ±5 mm Hg to a barometer referenced to a NIST standard.
- A water and antifreeze mixture (50/50), or oil manometer with a 0 to 400 mm (0 to 16-inch) range and a minimum scale division of 1 mm (tenths of an inch).
- New motor(s). The new motors are located on the work bench in the "Big Lab" with labels giving motor number, run number, and new brush date.

3.2.2 Motor Exchange

At least three flow rates should be taken that are in the acceptable flow range from 1.02 to 1.24 m^3/min. The design flow rate is 1.13 m^3/min. *Do not change a motor on a windy day. The wind can*

cause the meniscus in the manometer to fluctuate up and down and cause the readings to be inaccurate.

1. Take a barometric pressure. The pressure is taken with the ultimeter. Press the "on/off" button on the ultimeter. Make sure that the ultimeter is off and then press the "on/off" button and the "-" (negative) button at the same time. The ultimeter will display the ambient barometric pressure, P_a, in inches of mercury. Record the pressure on the PM-10 MOA Air Quality Mass Flow Controller Sampler Field Calibration Sheet.
2. Take an ambient temperature, T_a, in degrees Fahrenheit. Place the thermometer near the sampler, but not in direct sunlight. Record the reading on the back of the Dixon paper and on the MFC Sampler Field Calibration Sheet. Place the Dixon paper under the thumb tight screws of the sample cassette that is going back to the lab.
3. Open the top of the sampler as far as possible. Unplug the motor from the flow controller by lifting up the filter cassette screen and disconnecting the motor from the filter screen. Be careful not to stretch the line too far (this is the flow controller line). Keep the gasket attached to the assembly and not the motor.
4. Disconnect the air line from the small connection on the side of the bottom of the motor.
5. Remove the old motor by pushing it up through the opening for the filter holder.
6. Balance the new motor on the opening of the sampler. Place the new motor in keeping the same orientation as the old motor.
7. Reconnect the filter cassette screen and gasket to the motor making sure to center the screen on top of the motor. Balance the motor on the opening of the sampler. Lift the motor and cassette screen unit and place it back down into the housing unit of the sampler. The housing gasket should be underneath the filter cassette screen at this time in order to prevent air from flowing in.
8. Plug in the motor to the flow controller and re-attach the air pressure tubes to the motor. Make sure all connections are tight.

3.2.3 Single Point Check and Motor Calibration

The single point check and multi-point flow-rate calibration procedure outlined below relates known flow rates to the pressure in the exit orifice plenum. The known flow rates are measured by an orifice transfer standard that has been calibrated annually with a standard volume meter traceable to NIST. An orifice transfer standard with calibration once per year traceable to NIST is needed for this procedure. The exit orifice plenum is the area below the motor that contains the air flow immediately before it is exhausted to the atmosphere through the exit orifice. This pressure is measured with the oil manometer mounted on the side of the sampler.

1. Take the flow transfer standard/orifice out of its black case (which resides in the tool box on the bed of the truck), place a clean filter on the filter cassette screen, and place the plate of the orifice onto the filter and filter cassette screen. Be sure that the orifice plate is centered on the filter and filter cassette screen. Tighten the screws of the filter cassette screen onto the orifice plate.
2. Connect the "top-hat" onto the orifice plate. Connect the air hose to the orifice.

3. Before the orifice tubing is connected to the orifice manometer, a leak test must be performed. Turn on the motor via the switch on the mechanical timer. Place your thumb over the tubing hole and place the palm of your hand over the top of the orifice to get a complete seal. With the other hand, check the bottom of the motor for air leaks.

   Caution: Do not run the sampler for longer than 30 seconds at a time with the orifice blocked. Running the sampler for too long with the orifice blocked can increase the chance that the motor will overheat due to the lack of cooling air. Overheating can shorten the lifetime of the motor and can also result in raising temperatures to the point of breaking down the electrical insulation, which could lead to fire or electric shock to the user.

4. If there is a slight leak, tighten the orifice and orifice plate with the black screw knobs and repeat the leak test. If there is still a leak check the entire system (motor, tubing, connection tightness, gaskets) to find the leak. When the leak test is completed, reconnect the tubing to the orifice manometer.

5. Allow the sampler to continue to run.

6. Connect the electronic manometer to the orifice. Take a flow controller reading, a manometer plenum reading, and an electronic manometer orifice reading. These readings will provide a baseline for motor performance. The meter on the flow controller reads approximately 40 cfm when the motor is performing normally.

7. Turn the sampler off.

8. Connect the Variac by unplugging the motor from the flow controller and plugging the Variac into the motor. Use the power strip or extension cord inside the sampler to plug the Variac into the motor. Connect the power supplying the sampler (which comes in at the bottom of the machine) and connect the Variac to the power strip or extension cord. Pay attention to where each cord goes as there are three cords from the timer and only two are utilized. Additionally, no two samplers among the sites are set up the same way, so one must note the differences among the machines.

9. The Variac has a dial on top with reading marks from 0 to 100 in increments of 10. The silver on/off switch is located on the front face. A small black knob is located on the side of the Variac and contains a fuse that can burn out occasionally. Turn on the Variac and adjust it to the 100 mark.

10. Take a plenum manometer and orifice manometer reading. Record the readings on the PM-10 MOA MFC Sampler Field Calibration Sheet (Appendix I).

11. Take plenum manometer and orifice manometer readings at the 90, 80, 70, 60, 40, and 30 marks on the Variac. Record the readings on the MFC Sampler Field Calibration Sheet . The manometer readings at the different motor levels will provide the data necessary for a regression analysis in the laboratory.

12. After the last reading, turn off the Variac and disconnect the orifice and the digital manometer. Repack all of the equipment from the lab.

13. Reset the mechanical timer and elapsed time clock making sure that the sampler will run on the correct day. Install a new filter for the next run (See Section 5.1).

14. Turn the sampler on by flipping the switch on the mechanical timer and record an initial manometer reading on the back of the Dixon chart

15. Record the day the sampler is scheduled to run on the back of the Dixon chart. Place the Dixon chart in the Dixon recorder, graph side facing out, and clamp down the red marker and arm within the recorder. Close everything on the sampler and turn the sampler off.
16. Make sure everything is locked, equipment is put away, and keys are stored in their previous locations. The replaced motor now needs to have the brushes changed or a new motor put into the motor housing and a new motor number assigned at the lab.

3.2.4 Data Entry

1. Perform the calibration calculations by entering the data from the single point check and motor calibration into worksheets at the lab. A regression analysis is performed to determine the relationship between the actual volumetric flow rate, Q_a, as indicated by the calibrated orifice and the flow rate measured through the sampler, P_{ext}. A detailed discussion of the regression equations can be found in the Federal Reference Method for the Determination of Particulate Matter as PM-10 in the Atmosphere (High-Volume PM-10 Sampler Method) (EPA, 1989).
2. Open the MFC Sampler Calibration Sheet (G:\ESD\Aq\AIR_DATA\PM10\ Pm10 MTR Calibration Form.xls). The workbook has a worksheet tab for each site. Choose the appropriate site and click on the associated worksheet tab.
3. Type in the date, time, site and sampler number, motor number, and ambient temperature, T_a, and ambient pressure, P_a (from steps 3 and 5 in the Motor Exchange procedure). The Orifice ID and calibration information should already be displayed in the worksheet.
4. Type in the orifice and plenum manometer data from the field sheet into the data table on the MFC Sampler Calibration Sheet. Q_{actual} and $P_{external}$ should automatically be calculated within the worksheet. The regression equations found in the FRM are programmed into the worksheet. Be sure that the slope and intercept information as well as the correlation coefficient, r^2, on the graph below the data table changes as Q_{actual} and $P_{external}$ are calculated in the data table. The correlation coefficient should be greater than 0.990.
5. Enter the values for the slope, m, and intercept, b, at the bottom of the form beneath the graph. These values must be entered manually and can be found from the equation displayed within the graph. Update the title of the graph with the current site information. Also, write the slope, intercept and correlation coefficient values on the MFC Sampler Field Calibration Sheet.
6. Enter your name on the "Calibrated by:" line.
7. Save the updated form on the G drive at: G:\ESD\Aq\AIR_DATA\PM10.
8. Print the form out and staple it together with the field form and store them in the gray metal notebook until the next motor change. After the next motor change, older calibration sheets are stored in the top drawer of the green file cabinet in the basement office under the PM-10 Motor Calibrations file.
9. Open the current PM-10 quarterly Excel file (e.g. PM10Q32005.xls). The file is located at: G:\ESD\Aq\AIR_DATA\PM10. Click on the "Cal" tab and input the date, motor number, and slope, intercept, site name, and R^2 value information from the MFC Sampler Calibration Sheet. Save the updated file and then close it.

10. Open the single point check form. The file is located at: G:\ESD\Aq\AIR_DATA\PM10\1PTCKSSP.xls. Select the Single Point Check tab. Update this form with information from the MFC Sampler Calibration Sheet. Save the updated file on the G drive and then close it.

4 LABORATORY PROCEDURES

This section presents information pertinent to the routine operation of the Air Lab as it is used for PM-10 monitoring. It covers multiple topics from daily laboratory procedures to PM-10 filter preparation and processing.

4.1 Laboratory Start Up Procedures

These procedures are followed on a daily basis.

1. Turn on the laboratory computer. Open the quarterly PM-10 Excel file. It can be accessed by going to G:\ESD\Aq\AIR_DATA\PM10\PM10Q32005.xls (or the most recent quarter's spreadsheet). Click "Don't Update" to the links to other data sources question in Excel.

2. In the black binder labeled "Lab P/T", record the temperature (°F) of the inside of the refrigerator in the back of the basement office. The temperature is displayed on the digital thermometer located on top of the refrigerator.

3. The daily pressure and temperature (PT) need to be recorded in two places; the black Lab P/T binder and in the Excel PM-10 quarterly computer file in the PT worksheet. The black binder is located on the shelf directly behind the desk in the basement office. To get the high and low temperatures from the prior day, go to the webpage on the internet for the National Weather Service Forecast Office for Anchorage (http://pafc.arh.noaa.gov/climate.php). In the "Select a Site" box on the webpage, select Anchorage. The observed highs and lows for the current month as well as the normal highs and lows for each day will be displayed in a table. If the webpage has not been updated for the previous day, call (907) 266-5105 ext. 4 and ask for the International Airport site temperature data for the previous day.

4. In the log book, locate the prior day's date, enter the high and low temperatures from the webpage and the normal high and low temperatures following the established format in the log book. Also enter the average of the high and low temperature from the prior day into the Excel spreadsheet in the Temperature column of the PT worksheet.

5. Find yesterday's average barometric pressure from the Cole-Parmer Barograph (Model 8570-00) located on the shelf behind the desk in the basement office. Estimate yesterday's average barometric pressure by observing the red pen line across yesterday's 24-hour recording and estimating the average barometric pressure from the line. Enter the barometric pressure into the log book in the correct column and into the Excel spreadsheet.

6. Record readings for percent relative humidity (RH) and temperature in degrees Fahrenheit (°F) from the Omega White Box located beside the Cole-Parmer barograph. There is a switch in the lower right hand face plate that switches the readouts of the machine. Record the readings in the log book. These values reflect current lab conditions.

7. Wall mounted instruments that record temperature and pressure are located on the west wall of the office above the counter. Record the temperature and pressure from these units in the log book under today's date. These readings also reflect current lab conditions.

8. In the PT sheet go to the next date and copy rows from columns A to E and copy down the formulas for the next day entry. Save the data on the G drive and close the spreadsheet.

4.1.1 Changing the Paper on the Cole-Parmer Barograph

Changing the chart paper on the barograph is ideally done on Wednesdays.

1. Take a new piece of chart paper for the barograph from the drawers behind the desk in the basement office.

2. Label the new paper in the upper left corner with the date of the paper change along with the date one week later when the paper will be changed again. For example, if the paper is changed on September 14, 2005, one should write "9/14/05 to 9/21/05". The paper on the barograph needs to be changed once every 7 days.

3. Flip open the silver latches on the sides of the barograph and lift the top off.

4. Release the silver arm that holds the red pen with the lever at the base of the arm. Release the paper by removing the silver clip that holds the paper to the drum.

5. Install the new paper by wrapping it around the drum until each end of the paper overlaps.

6. Re-install the silver clip that holds the paper to the drum.

7. Wind the knob on the top of the drum nine to 10 half turns so that it will run for one week.

8. Return the red pen onto the paper at the current time delineation on the chart by pushing on the lever at the base of the silver arm that holds the pen.

9. Replace the top onto the barograph and close the silver latches on the side.

10. File the used barograph paper from the previous week in the appropriate drawer behind the desk in the basement office.

4.1.2 Changing the Paper on the White Box

Changing the paper on the White Box is ideally done on Wednesdays.

1. Slide the latch down on the right side of the White Box to open the face plate.

2. Swing open the face plate and pull off the magnetic knob in the center of the White Box.

3. Pull off the used chart and check to see if it is used on both sides. If it is not used on both sides, re-use the current chart on the other side. If it is used on both sides, Get a new piece of graph paper for the White Box from the appropriate drawer behind the desk in the basement office.

4. Label the chart along the outer edge with the date of the paper change through the date one week later when the chart will be changed again.

5. Place the chart back in the White Box in the center at the approximate current date and time on the chart.

6. If a new chart was used, place the old chart in the Ziploc bag for the old White Box charts in the appropriate drawer behind the desk in the basement office.

4.2 Mettler AE 100 Balance Startup

4.2.1 Calibration

1. Remove the cloth scale cover, and open the Excel quarterly data file on the computer (e.g. PM10Q32005.xls). Select the Mano worksheet in the Excel file.

2. Turn on the balance by pressing the black bar. 0.0000 will appear in the display. Check that all the sliding glass doors on the balance are closed.

3. Open the front door of the scale located on the bottom half of the balance. Grasp the metal grate and carefully lift it up and back off the hooks and place it on the bottom floor of the scale. Close the balance door.

4. Press and hold down the black bar until "CAL" appears in the display window. A flashing 100 will then appear in the display window. After the flashing 100 appears, slide the black knob on the lower right side of the scale back towards the wall.

5. Wait for 100.9999 to appear in the display window and then observe CAL with a flashing 0 in the window. Slide the black knob forward.

6. Wait for 0.0000 to appear and then replace the metal grate back onto the hooks.

7. Close the scale door. 33.4169 grams (g) should appear as the tare weight. Depress the black bar. 0.0000 should appear in the display window.

4.2.2 Quality Assurance

Following calibration, perform the following quality assurance (QA) check. Also perform this check every tenth filter weighed during the filter post-weighing procedure.

1. Find the small blue log book labeled "Air Lab QC AE 100 Scale" on the cover. The log book is located beside the balance.

2. Slide the left glass door on the balance open and, using tweezers, place the two 2 gram weights on the center of the scale. Shut the door, allow the scale to settle, and then record the weight into the blue log book under "Pre-4" column.

3. Remove the two gram weights and repeat the weighing procedure for the 5 gram weight and record the weight in the "Pre-5" column in the log book.

4. Remove the 5 gram weight, and at the end of each filter weighing session, repeat the weighing procedure with the 5 gram weight again for the end post-weight. Record the post-

weight in the log book in the "Post 5" column. Write the date and your initials the in log book.

4.2.3 Computer Preparation

The following procedure connects the Mettler balance with the computer through the Mettler Toledo Balance Link (Version 2.20) program.

1. On the computer, go to the Start Menu, select programs, then select Mettler Toledo, then select Balance Link. The Mettler Toledo Balance Link program will startup.

2. The box "About Balance Link" tells the operator if the balance is connected. If the balance is connected a picture of a balance will appear in the box along with a message that the balance is connected. If it is not connected, check the red breaker button on the back upper right side of the balance. Switch the breaker if the fuse has blown and try opening Balance Link again. The opening Balance Link message box should appear, the picture of the balance should come up, and the balance should be connected. If it is not, contact the Department of Health and Human Services computer technical support staff for help.

4.3 Filter Preparation

This subsection describes the procedure for preparing filters for deployment in the field. **Filters need at least 24 hours to equilibrate in the lab before pre-weights can be measured.** All new boxed filters for the calendar year are stored and arranged chronologically on the top shelf of the glass cased cabinet directly behind the desk. The equilibrated filters ready for weighing are placed horizontally in the black file holder. They are separated by sheets of paper in small groups of 10-15.

1. Open the most recent quarterly PM-10 Excel spreadsheet (e.g. PM10Q32005.xls). Select the "Tare" worksheet and scroll down to the last line on the spreadsheet.

2. Locate the equilibrated filters in the black file rack on the counter directly behind the desk. The filters on the first slot to the left are the next batch to be weighed. Note: Filters need at least 24 hours to equilibrate before pre-weights can be measured. Determine the next filter to be deployed by looking at the Tare worksheet and the next available filter in the black file holder.

3. Inspect filters for any deformations, such as pin holes, discolorations, etc. by holding the filter up to the light.

4. Insert the balance operator's initials, the filter pre-weight date, and the lab relative humidity and temperature from the White Box. When doing the duplicate pre-weights, insert the necessary information in the duplicate pre-weight columns in the spreadsheet.

5. Re-zero the scale by depressing the black bar once.

6. Open the door on the bottom half of the balance, insert the filter onto the metal grate with the number side down and forward. Align the filter with the white guide lines, close the door, and allow the scale to settle.

7. Find the corresponding filter number in the Tare sheet, place the cursor in the appropriate cell in the pre-weight column (B), and when the scale is completely settled, press the "print screen" button on the keyboard. All filters must be re-weighed before they are used in the field. Duplicate weights should be entered in the pre-weight duplicate column (C). Duplicate weights must be within 2.8 mg of the original weight. Save all work in the quarterly Excel file on the G drive.

4.4 Sample Filter Post-weighing

4.4.1 Computer Preparation for Sample Filter Post-weighing

1. Open the quarterly Excel PM-10 spreadsheet (e.g. PM10Q32005.xls). Select the "Don't Update" option in the Excel message box that pops up after the program opens. Select the "Mano" worksheet and arrow down to the last line on the spreadsheet. Determine the sample date, motor number, the filter installation date into the sampler (pre-date), the manometer reading from the installation date (Mano (i)), the date the filter was removed from the sampler after the sample run (post-date), the manometer reading from the post-date (Mano (f)), the elapsed time from the elapsed timer clock, and the filter number (press "F2" to automatically fill in the first several numbers) for each filter in the batch of filters to be weighed and update these fields on the last line of the worksheet. This information can be found on the back of the Dixon chart from the field.

2. Go to the end of the row and update the date weighed field. Also update the RH and temperature fields using the Omega White Box for the most current laboratory conditions.

3. Determine how many filters need to be weighed and copy the format of the rows in the spreadsheet down as many rows as needed. Copy the format down one extra row for the next weighing session. Return to the first new row to begin weighing session. Save all work.

4.4.2 Sample Filter Post-weighing

During this procedure, the balance must be checked every tenth filter weighed using the Quality Assurance procedure outlined in section 4.2.2.

1. Collect the cassettes with sampled filters and stack them by order of appearance of sites in the white notebook for PM 10 (PM 10 Hi Vol. Sampler Data Sheets). The notebook is located on the desk in the book holder. Note: each site is assigned a number, which is written along with the site name in the white book. For example: Garden A is 18A.

2. In the second column of drawers from the right, behind the desk in the basement office, in the second drawer from the top, get the MOA PM 10 data sheets. Take as many as you need for the amount of filters needing to be weighed. These sheets are also located on the computer server at: G:\Air Quality\Air Data\PM10\PM10 Data Sheet.doc.

3. Enter the sample date, the motor number, pre-date (date of filter installation), date weighed, the lab RH, and the lab temperature in the forms. Fold the sheet in half length-wise with the printed side out. The weighed filters will be folded in half and stored inside of these folded sheets after each measurement is complete.

4. Re-zero the scale by quickly depressing the center of the black bar on the Mettler AE 100 once. Take the first filter cassette, remove the thumb screws, remove the Dixon paper (round graph), and transfer the information from the Dixon onto the folded data sheet.

5. Remove the sampled filter from the cassette carefully, touching only the edges. If there are large particles or bugs, carefully remove them with tweezers. Slightly fold the filter in half length-wise folding the particulate side inward.

6. Open the bottom door to the Mettler AE 100, insert the filter dirty side up with the filter number facing down and entering the scale first. Gently place the filter on the metal grid and align the filter with the white guide indicator lines.

7. Close the door and allow the scale to fully settle. Replace the thumb screws and place the cover on the empty cassette. Stack the empty cassettes off to the side. Enter the data from the Dixon into the appropriate cells in the spreadsheet, following the format.

8. Once the data is entered to the post weight column (column K), check the stability of the reading on the scale. When the balance has stabilized, press the "print screen" button on the keyboard and the weight of the filter will be automatically entered into the spreadsheet. All other data will automatically be computed via formulas within the spreadsheet.

9. Finish completing the MOA PM-10 Data Sheet using the information from the Excel quarterly spreadsheet. Staple the Dixon paper to the data sheet.

10. Insert the weighed filter folded inward lengthwise into the folded MOA PM-10 Data Sheet.

11. Enter the 24-hour PM-10 values onto the data sheet and into the white PM-10 notebook. These values come from the Excel spreadsheet and are the PM10(std) value and the PM10(act) value. They should be written in the box on the data sheet as "PM10(std) value/PM10(act) value" and into the white PM-10 notebook under the corresponding site and filter location. Place a check mark on the upper left corner of the folded MOA PM-10 Data Sheet to indicate that the PM-10 information has been entered into the white PM-10 notebook.

12. Repeat this weighing procedure for each cassette until all post-weights are done. Save the work. Stack all of the weighed filters on the desk until the quality control procedure is performed for them a few days later.

13. Change all the numbers in the cells which are currently formulas to values, except for the extra line at the bottom that is reserved for the next weighing session. To change formulas to values, highlight all current data entries, copy them, and "paste special" as values only. Save all the work on the G drive.

4.5 Dixon Preparation and Cassette Deployment Preparation

Dixon charts are ordered from Inter-mountain Laboratories (Phone: 307-674-7506) and have order number: DIN-106 Charts.

4.5.1 Dixon Chart Preparation

1. Take out the needed number of Dixon charts for deployment. Use the white PM-10 notebook to determine how many filters need to be deployed and take out one Dixon chart for each filter needing deployment. Dixon charts are pre-stamped on the back with areas to insert the necessary dates and readings for run information in the field. The stamp is located in the top right hand drawer against the wall unit directly behind the desk in the basement office.

2. Enter the site name, motor number, filter number, the date the analysis is set to run, the initial manometer reading, and pre and post run dates into the white PM-10 notebook and onto the Dixon chart.

4.5.2 Cassette Deployment Preparation

1. Take an empty cassette, insert a weighed filter, numbers side down, and replace the thumb screws, catching the completed Dixon chart into one screw to attach it to the cassette.

2. Place a cassette lid over the top of the filter and secure.

3. Stack all the cassettes alternately to keep screws from tearing the gaskets. Place all the cassettes that are readied for deployment into a plastic box for easy transport to the site

5 FIELD OPERATIONS

This section presents information pertinent to the routine field operation of the High Volume PM-10 Sampler.

5.1 Sample Filter Installation and Exchange

This section discusses the steps needed to install filters. The PM-10 High Volume Sampler must always (except when performing certain maintenance and diagnostic procedures) be operated with a quartz fiber filter installed in a filter cassette (Figure 5-1). At any site, three machines can run at a time, but no more due to electrical restrictions.

Figure 5-1. Quartz fiber filter installed in the PM-10 sampler.

5.1.1 Filter Cassette Deployment

1. Upon arrival at the site, gain access to the roof by a ladder or stairs.

2. Turn on the PM-10 sampler by flipping the switch on the mechanical timer mounted on the side of the sampler and allow the sampler to warm up for five minutes.

3. Open the Dixon recorder located on inside of the PM-10 sampler bottom door and remove the Dixon chart.

4. Take a manometer reading (from the manometer located on the side of the sampler) and record the reading under the pre-mano date on the new Dixon chart from the lab.

5. Check the Dixon chart on each PM-10 sampler. If a post-run manometer reading needs to be recorded, turn on the sampler and let it warm up for five minutes. Take a reading from the manometer and write both the manometer reading and the time of the reading on the back of the Dixon on the post-mano line.

6. Turn off the sampler. Open the lid of the sampler by releasing six latches around the perimeter of the top of the sampler and lifting the cover, exposing the filter plate area.

7. Place the used Dixon chart under the thumb screw of the filter cassette in the sampler, making sure all the information on the back of the Dixon chart is complete for the pre-date filter installation day, post-date filter retrieval day, and elapsed run time.

8. Use the cassette replacement cover from the new filter cassette you are about to exchange into the sampler to cover the filter on the cassette that is still currently installed in the sampler. Unscrew the four black knobs around the edge of the filter, remove the old cassette, and replace with a new cassette and filter.

9. Lock down the new cassette by tightening the black knobs. Close the lid of the sampler and close all the latches. Determine the start date for the next run from the new Dixon chart and set the mechanical timer to the appropriate time and day to start the run.

10. Get a manometer reading and write it in the pre-mano area on the back of the new Dixon chart. Install the new Dixon chart into the Dixon recorder.

11. Re-zero the elapsed timer (Westclox) located inside the lower door of the sampler. Make sure the time reads midnight.

12. Turn the sampler on manually using the switch on the seven day mechanical timer. Let the sampler warm up for five minutes. Take a manometer reading and write down the reading on the pre mano date line on the Dixon chart.

13. Turn off the sampler.

14. Put the Dixon chart in the Dixon recorder, making sure to align the chart under the small holder clips. Depress the arm that holds the red pen and close the Dixon recorder door sealing tightly.

15. Repeat this procedure for each sampler at the site.

16. Check before leaving that each seven day timer is set correctly, elapsed timers are set correctly, and all the latches are closed on every sampler.

17. Repeat this procedure at each needed site, retrieving sampled filters and deploying new filters.

18. Return to the lab with exposed filter cassettes.

19. In the lab set all exposed cassettes on the desk with the lids ajar for at least 24 hours to equilibrate the filters before they are weighed.

20. To post-weigh the filters, refer to the post-weighing procedures in section 4.4.2 in this SOP.

6 QUALITY CONTROL

Essential to acquiring quality data are scheduled visits to the monitoring station to verify the operational status of the monitoring system. Several visits to the stations per week are made by the PM-10 operator to inspect the monitoring equipment. Ensure Table 6-1 (p. 23) is filled out once a month for review by the Quality Assurance Officer.

6.1 Logbook Requirements

The two main logbooks for the PM-10 monitoring program are the White Book, a white binder labeled PM-10 High Volume Sampler Data Sheets, and a black binder that holds the monthly single point check information and the QA/QC and maintenance information for all the sites. They are used as an official record for documenting all PM-10 maintenance activities, quality control checks, site visits etc. The documentation will indicate the date and time of the site visit. The operator will also indicate in the logbook all activities such as filter exchange, any maintenance, and QC checks that are performed. Keeping the logbook up to date is imperative for data validation requirements.

6.2 QC Single Point Check

A single point check assures that the flow rate of the sampler falls within specifications. The flow rate checks must be performed upon installation and after any maintenance activity. Flow rate checks must be performed at least once every 30 days. Sections 3.2.3 and 3.2.4 of this document describe the procedure for a single point check.

Deviation of 10% or greater from the design value in flow rate (1.13 m^3/min) during sampling requires that the sample data be flagged for potential invalidation by DEC. Flow rate deviations of more than 10% as determined by a monthly field flow rate verification check may cause invalidation of all samples collected since the last acceptable flow rate check.

6.3 Sample Filter Post-weighing Check

Every tenth sample filter must be post-weighed on a different day than the first post-weighing procedure for quality control purposes. The two weights must be within 5 mg to be acceptable. The quality control procedure follows:

1. Open the current PM-10 quarterly Excel file (e.g. G:\ESD\Aq\AIR_DATA\PM10\PM10Q32005.xls). Click on “Don’t Update” in the opening message box. Select the QAQC tab in the workbook.

2. Every tenth sample filter from the current quarter needs to be weighed. Take each tenth filter and enter the necessary information into the appropriate cells in the spreadsheet.

3. Re-zero the balance and follow steps 6 through 8 in the weighing procedure outlined in Section 4.4.2 of this document.

4. Write a star on top of the PM-10 Data Sheet for that filter to indicate that the filter as been re-weighed for quality control purposes.

5. Once all the filters are weighed and the information is entered into the spreadsheet, store the filters on the shelves in the glass cabinets behind the desk in the basement office.

6.4 Clock and Timer Verification

The 7-day mechanical timer and the elapsed time clock should be checked for accuracy once every 30 days. Both of these clocks are referenced to a watch adjusted to NIST time once per month.

6.5 Ultimeter and Thermometer Verification

Once per quarter the barometric pressure readings on the field ultimeter, and the Cole-Palmer Barograph should be checked against the Anchorage International Airport barometer. The barograph and ultimeter are sent to Inter-mountain Laboratories (Phone: 307-674-7506) for calibration once per year. The quarterly verification procedure follows:

1. Open the most recent Excel Quarterly PM-10 computer file (G:\ESD\Aq\AIR_DATA\PM10\PM10Q32005.xls) and select the "PT" worksheet.

2. Scroll over to the right side of the sheet and notice the table labeled "Quarterly BP Checks." Update the dates and times in the table.

3. Take out the ultimeter and NIST traceable thermometer.

4. Call the airport phone number listed in the upper left-hand corner of the table, 266-5105 ext. 4., and ask for the barometric pressure at the airport and Merrill Field.

5. Update the Quarterly BP Checks table in the PT worksheet with information from the airport barometer, the hand-held ultimeter, and the Cole-Palmer barograph. The ultimeter and barograph should each be within ±5 mm Hg of the airport barometer (Note: Units in the table are in inches of mercury).

6. Compare the White Box thermometer and wall thermometer to the NIST thermometer and update the temperature section of the Quarterly BP Checks table.

7. Copy and paste the Quarterly BP Checks table into the PT Worksheet in the rows designated for the next quarter (rows are further down the spreadsheet). This table will be updated at the next quarterly BP check.

6.6 Thermometer Calibration

The laboratory and field thermometers must be calibrated once per year to a NIST or ASTM thermometer. The laboratory and field thermometers must read to within ±2 °C of the reference thermometer.

6.7 Balance Calibration

The Mettler AE-100 Balance is cleaned and calibrated to ASTM standards once per year by Northwest Instrument Services (Phone: 360-202-0960). The routine calibration and quality assurance procedure for the balance can be found in Section 4.2 of this document.

The two gram and five gram weights are sent to Quality Control Services in Portland, Oregon (Phone: 503-236-2712) once per year for re-certification.

Table 6-1. PM-10 QC Check Data Sheet

Station # _____ Date: _____

Location: _____ Time: _____

Monitor # _____ Operator: _____

Thermometer Serial # _____

- Certification Date: _____

Barometer Serial # _____

- Certification Date _____

Barometer Field Standard Serial # _____

- Check Date _____

Flow Standard Serial # _____

- Certification Date: _____

QC Check

Temperature Check
Ambient

Actual _____ ^{o}C Indicated _____ ^{o}C Difference _____ ^{o}C

Pressure Check

Actual _____ mm Hg Indicated _____ mm Hg Difference _____ mm Hg

Flow Check

Actual _____ m^3/min Indicated _____ m^3/min % Difference _____ %

QC % Difference = $\left[\frac{Ind - Act}{Act}\right] \times 100$

Time Check

Actual Time _____ Indicated _____ Difference _____

Add copy of this completed form to the data QA file.

7 MAINTENANCE PROCEDURES

This section presents the routine maintenance procedures for the High Volume PM-10 Sampler. The operator may find that routine maintenance is site-specific and can vary from location to location. Increases in the routine maintenance frequencies might be necessary due to the operational demands on the samplers. All maintenance activities are to be documented on the PM-10 High Volume Scheduled Maintenance and QA/QC Form (Appendix I) and in the PM-10 logbook. Table 7-1 is a summary of required maintenance procedures and frequencies.

Table 7-1. Routine Maintenance Activities

ACTIVITY	REQUIRED FREQUENCY
Inspect gaskets	Each time a cassette is loaded for cassette gaskets. Every 3-months for motor and housing gaskets.
Inspect vacuum tubing, power cords, and fittings	Check for crimps, cracks, or obstructions on sample recovery days. Fittings should be checked for tightness.
Motor change and multi-point calibration	Every 30 runs
Flow QC single point checks	Monthly
Leak test	Monthly (concurrent with flow QC check)
Change or clean impaction plate	Monthly
Clean PM-10 inlet	Monthly
Clock adjustment	Check monthly and adjust as needed
Replace Dixon recorder pen	Every 30 days or as needed.
Verify ultimeter against airport barometer	Quarterly

7.1 Supplies And Tools Recommended For Maintenance:

- Dow Corning Lubricant #316 Silicone Release Spray
- Additional new motors
- Additional new motor brushes

- Paper towels
- Distilled water
- Tools: pocket knife, flat tip and Phillips head screwdrivers, 2 adjustable wrenches

7.2 Cleaning the PM-10 Sampler Inlet

The PM-10 inlet must remain free of significant contamination to ensure a correct particulate size cut-off at 10 μm. The cyclone inlet must be cleaned quarterly to prevent buildup of particulate matter and contaminants.

Follow the procedure below to maintain the PM-10 inlet:

Caution: Bees can use the inlet as a hive, so be careful during disassembly.

1. Loosen the hand-tight screws around the cyclonic inlet and lift the top layer of the inlet off.
2. Wipe off all parts of the inlet including the inlet screen with paper towels.
3. Re-assemble the inlet and tighten the screws.

7.3 Changing and Cleaning the Impaction Plate

The impaction plate must be cleaned and re-greased monthly in order to prevent particle bounce that could allow particles larger than 10 μm through the SSI and onto the quartz fiber filter.

1. Open the latches on the top of the sampler and open the sampler to its widest position.
2. Lift the dirty impaction plate out of the sampler. Replace the plate with a clean impaction plate brought from the lab. Or if only one side of the plate is dirty, flip the impaction plate over, wiping off the dirty side with paper towels before re-installation with the clean side facing upward.
3. Wipe the inside of the nozzles on the sampler with a clean cloth or paper towel.
4. Close the sampler.
5. Bring the dirty impaction plate back to the lab.
6. Wipe the dirt off the plate with paper towels.
7. Bring the clean plate back into the field and spray the impaction plate with Dow Corning Lubricant #316 Silicone Release Spray prior to re-installing into the sampler.

Changing the Brushes on a Motor

To ensure a stable flow rate, the brushes on the motor need to be changed periodically. The brushes are model number 3339211 TSP/MFC Motor Brushes and are ordered from Inter-Mountain Laboratories (Phone: 307-674-7506). The brushes should be changed before the graphite shunt is worn down to the brass casing (Figure 7-1).

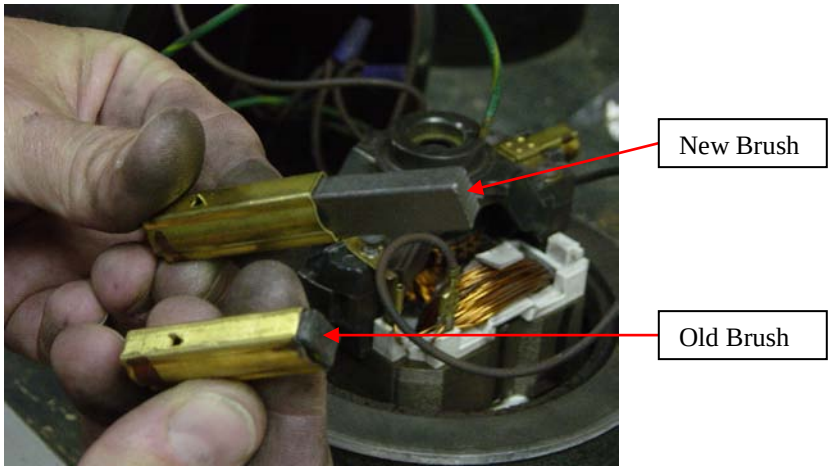

Figure 7-1. PM-10 High Volume Sampler Brushes

1. Remove the mounting plate motor cover by removing the four hex-head bolts or screws (Figure 7-2).

2. Release the power cord by turning the cap of the power cord connector (Figure 7-2) counter-clockwise. After unscrewing the cap, slide the cap, metal washer and rubber gasket toward the plug end of the cord.

3. While holding the motor inside the housing, flip the motor and housing over and carefully slip the housing off the motor while feeding the power cord through the opening in the housing. This will expose the motor (Figure 7-3).

4. Loosen the brush holder screws about three-quarters of the way (Figure 7-3).

5. Remove the old brush by pushing slightly upwards on the end of the brush and pulling the brush out. Notice the orientation of the notch on the brass casing of the brush after you pull the brush out of the motor.

6. Insert the new brush into the brush holder in the same orientation as the old brush. The brush should essentially snap in because of the notch. Re-tighten the brush holder screws.

7. Perform steps 4 to 6 for both brushes.

8. Replace the plastic housing back over the motor, pulling gently on the power cord to feed the wires back into the housing.

9. Flip the housing and motor over, holding the motor inside the housing as you turn everything over.

10. Push the rubber gasket on the power cord back towards the connection with the housing and tighten the cap of the power cord connection.

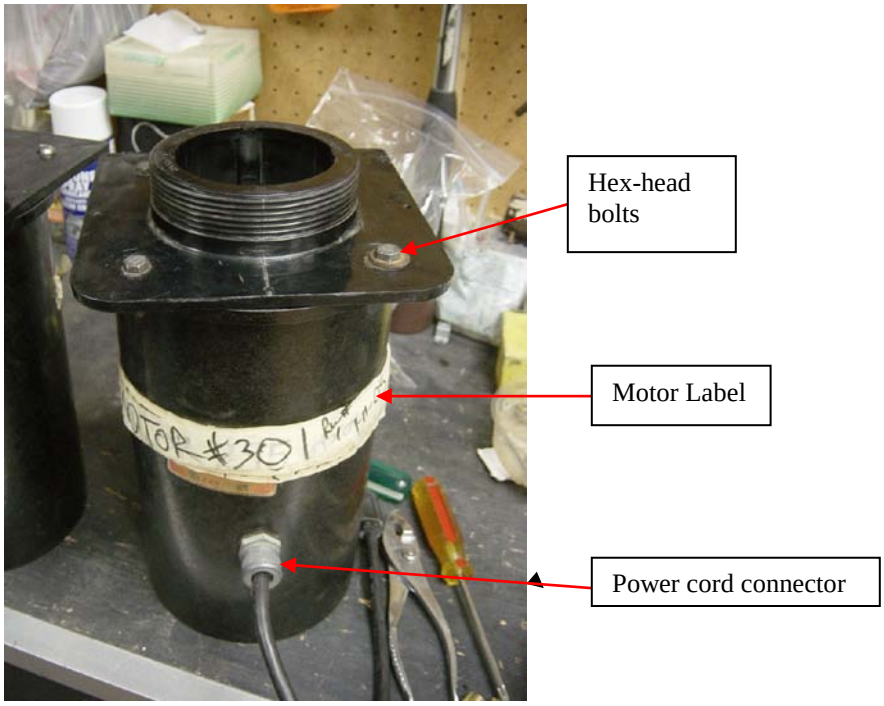

Figure 7-2. Motor Mounting Plate Cover and Housing

11. Replace the mounting plate motor cover and tighten the hex-head screws. Make sure the mounting plate cover is oriented so that the curved corners of the mounting plate face toward the side of the power cord (Figure 7-2).

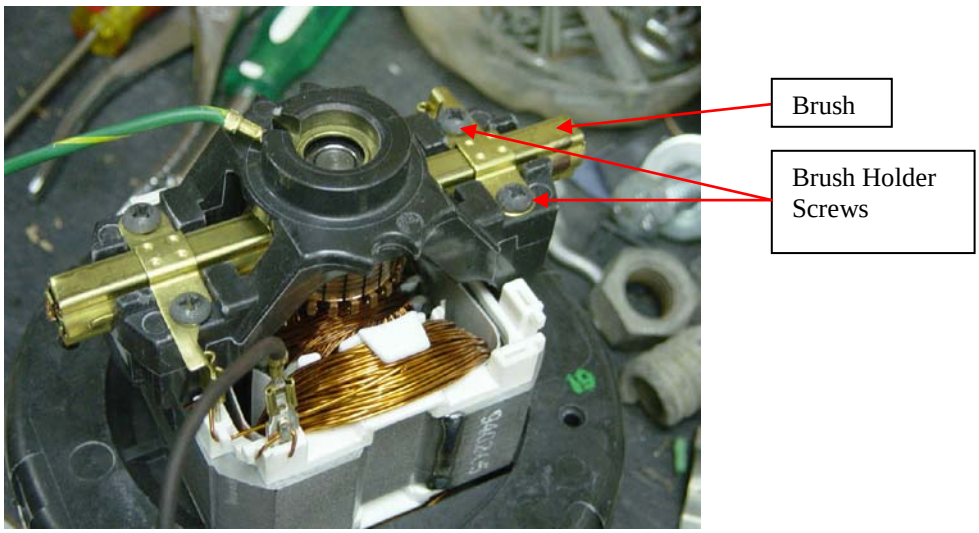

Figure 7-3. PM-10 High Volume Sampler Motor.

Figure 7-4. Motor Ready for Calibration

12. Screw a filter holder onto the top of the motor housing (Figure 7-4).

13. Plug the motor into a Variac, turn the Variac on, and set the dial to 20. Allow the motor to run at the settings and times outlined in Table 7-2. These runs prepare the motor for use in the field.

Setting	Time (hrs)
20	2
50	1
75	0.5

Table 7-2. Variac Settings and Run Times.

14. After the motor has run at the specified settings for the specified times, turn the Variac off and unplug the motor.

15. Put a masking tape label on the motor that states “New Brushes”, the motor number, the run number and the date the motor was prepared for the field. Motor numbers are sequential and

the latest motor number can be determined from the "Cal" spreadsheet in the quarterly PM-10 Excel file. Once this procedure is finished, put a check mark next to the date signifying that the motor is ready for the field.

16. The motor is now ready to be deployed into the field.

7.4 Motor Change

New motors are ordered from Inter-Mountain Laboratories (Phone: 307-674-7506) and are model number 11940200 TSP/MFC Blower Motors.

1. Perform steps 1 to 3 in from the Changing the Brushes on a Motor section above.

2. Disconnect the green grounding wire from the power cord wires (Figure 7-5).

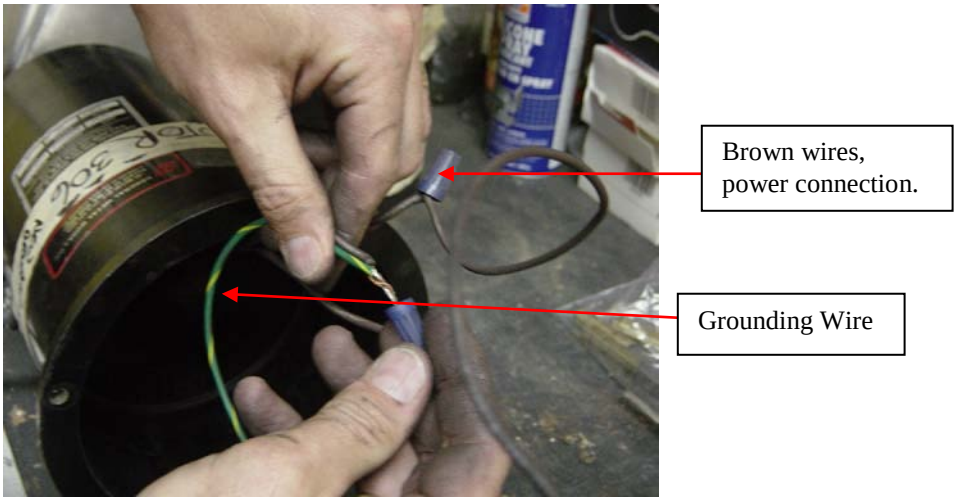

Figure 7-5. Wire Connections to the Power Cord.

3. Either remove the brown power wires from the new motor by sliding them off their connections (Figure 7-6) and connect the brown wires from the power cord onto the new motor or disconnect the old motor's brown wires from the power connection with the power cord (Figure 7-5) and connect the new motor's brown wires with the power cord. Before connecting the new power wires to the power cord, remove the foam and metal motor gasket from the old motor and place it on the new motor (Figure 7-6).

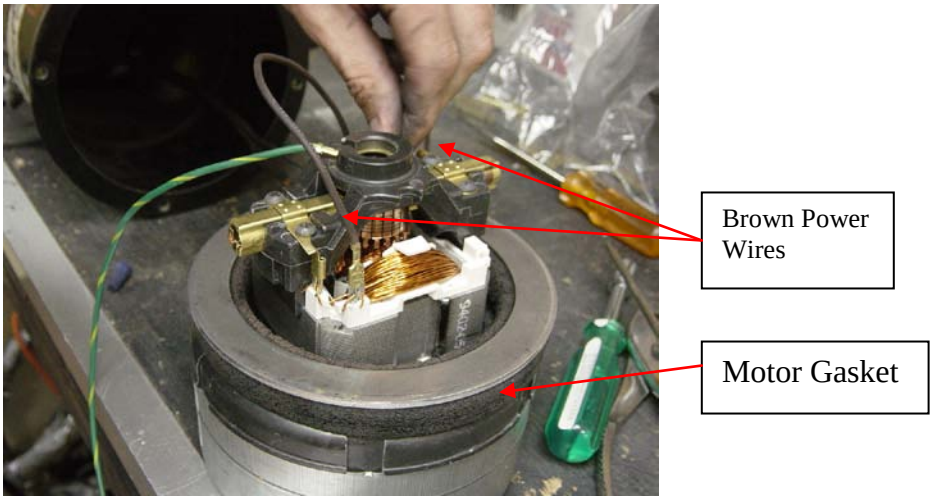

Figure 7-6. Removal of Brown Power Wires.

4. Connect the green grounding wire on the motor to the power cord (Figure 7-5). Twist the wires together clockwise to connect them.

5. Perform steps 8 through 14 in the Changing the Brushes on a Motor section (Section 7.3) above.

6. Put a masking tape label on the motor that states “New Motor”, the motor number, the run number (which will be “1” since the motor is new), and the date the motor was prepared for the field. Motor numbers are sequential and the latest motor number can be determined from the “Cal” spreadsheet in the quarterly PM-10 Excel file. Once this procedure is finished, put a check mark next to the date signifying that the motor is ready for the field.

7. The motor is now ready to be deployed into the field.

8 DATA VALIDATIONS AND REPORTING OF PM-10 DATA

This section discusses validations and reporting of PM-10 data.

8.1 Data Assessment and Validation

Data must be validated to ensure that all reported PM-10 measurements are accurate relative to the overall scope of the Anchorage Environmental Quality Program. The data validation process is based on specific criteria and when found to satisfy all the criteria, will be considered valid. The data that does not meet all the criteria will be invalidated. The data assessment and validation procedure follows:

1. Open the excel file for the appropriate quarter, for example, G:/Esd/Aq/Air_data/Pm10/Pm10q22000. Choose the "Don't Update" option from the opening message box in Excel.

2. Check VLookups to make sure they refer to the current file.

3. Right mouse click on the "Mano" tab to insert a new worksheet and rename it "QC."

4. Copy "MANO" into "QC" and add a comment column on the right.

5. Delete unnecessary header rows.

6. Check each entry under the heading PM-10 to make sure it is a number and not a formula. Change any formulas to numbers.

7. Delete columns "Date Weighed," "RH," and "T."

8. Delete anything outside of the data entry area and headings so it does not interfere with printing (Print preview is a quick means to review all on the sheet). Delete "formula line" which is usually the very bottom.

9. Select all data entries and sort by 1) Site 2) Sample Date 3) Sampler.

10. Note that any problem entries have been highlighted in red with comments on the right. These should have the site number asterisked so they can be sorted out.

11. Format the cells in all "Date" columns as mm/dd/yy.

12. Insert a new worksheet and label it "QC Statistics."

13. Open the previous quarter's PM10QC and copy the statistics area and paste it into the new worksheet just created, change the quarter title, and reset all values to zero.

14. On the QC tab, add a new column on the left and number the lines from the first data entry to the last. This gives a count of the data entry rows. This is the basis for the first statistic and will be used to identify randomly chosen entries later.

15. Record 10% of that number under QC statistics as the number of PM-10 values which should be checked for this QC effort.

16. On the QC page, select data including comments and sort by "Motor/Sample Date."

17. Underline the motor number for each first time the motor number appears. This is the "first time motor use."

18. Go to the Cal file and check that dates of calibration precede monitoring dates.

19. Select all data including comments and resort by count (column A).

20. Scroll down the motor numbers and make sure all first time motor uses are underlined by focusing at the beginning of each Site listing.

21. Count first time motors and enter the number under first time motors in the statistics table "check" column.

22. Compare first time motor use date in the spreadsheet with use date of first time motors in the "PM-10 High VOL Sampler Sheets" record book (White Book).

23. When an error is found, confirm it with the Air Quality Specialist. Note the change in the comment column (cf. next step) and in the appropriate statistics record, such as "wrong motor number," in the "Check" column, and highlight the "Motor" number in the spreadsheet for later recalculation. If a sampler letter or motor number or date is in error, the PM-10 calculation must be run with the calibration figures for the proper motor and the PM-10 value confirmed or corrected. If the PM 10 value changes, record one change in the statistics record in the PM-10 change column on the appropriate entry line.

24. If an error as above is noted, make a note of the changes necessary in the comment column so that the entry can be corrected later. After the first printing (below), make the necessary changes prior to sorting so that it is in the proper sequence with surrounding entries. Check surrounding entries for other possible errors of that type.

25. Check "Sample Date" and Manometer "Pre Date" and "Post Date" to make sure they are reasonable with the pre-date before the sample date and the post date on or after the sample date. To automate this, copy from the previous quarter and insert the three columns after the "Post Date" column labeled "Sample minus Pre" "Post minus Pre" and "Post minus Sample." Then filter for negative numbers that indicate a date error.

26. Filter to check the "Time" (acceptable range = 1380 – 1500) and "% Dev." (+/- 10 is NA) columns for values outside the acceptable ranges. Asterisk the site number for values to be excluded so that sorting later will place them at the bottom of the spreadsheet where they can be deleted, but do not delete them before the First Printing, below.

27. Go through the other items in the "QC Statistics" tab and check them. If some new discrepancy comes to light during this process, track it down, make appropriate corrections, and add a line to include that problem for future checking.

28. When a new problem is found, write a record on the "QC Statistics" tab below the statistics table explaining the problem and how it will be resolved in the future.

29. Split screen, then, in the "Sample Date" column, underline all repeated dates and their PM-10 values at the same site (collocated samples).

30. Check duplicate dates to make sure they are collocated samples by checking with the "PM-10 High VOL Sampler Sheets" record (the White Book).

31. Look at total in the "check" column of the statistics tab. Randomly select, using the random selection table in the front of the Procedures and QC Records book and the sequential number column added for this purpose, at least two entries, or enough to make the total equal to 10% of all entries. Highlight the random check samples in the random number column.

32. (First printing) Print a sorted (Site, Sample Date, Sampler), uncorrected copy for the record book. File, Page Set-up, sheet tab, rows to repeat at top: e.g. A2 for column headers. Print Preview, Setup, Page tab, Landscape, Fit to 1 page wide by e.g. 5 pages tall, sheet tab, add grid lines.

33. Copy the "QC" page onto a new tab and name it "QC Final."

34. Manually calculate the randomly selected PM-10 values and any other values that need manual calculation. To calculate: Fill out a PM-10 Calculation Sheet (two pages) with information as detailed on the sheet from the PM-10 Calculation Sheet together with the PT (pressure/temperature – scan to make sure entries are in a reasonable range and not entered in error) sheet and the Cal (calibration) sheet, making changes as required to correct any discrepancy. Recalculations for which there is no concern over wrong values in the lookups can be performed using the formula line at the bottom of the "MANO" page.

35. When recalculation changes the PM-10, add one to the PM-10 change column in the statistics table opposite the appropriate reason and note any reason not obvious, such as when the PM-10 does not change but the % Dev. changes to out of tolerance.

36. Copy the Null Data sheet from the previous quarter and insert a sheet for it in the current quarter. Count the calendar days for each site. Refer to the third day and sixth day monitoring schedule sheet to determine which days are monitoring days. Enter the null data code in the AIRS Null Data Codes sheet for each sampling day missed. Calculate the percentage of monitoring days missed. The minimum requirement is 75% data capture. If less than this write an explanation to send in with the report.

37. Copy and insert the Precision tab from the previous quarter.

38. Fill out the Precision Report for "standard" and for "actual," with collocated PM-10 data from QC Final using the first letter alphabetically as the "designated" sampler and the second letter alphabetically as the "collocated" sampler.

39. On the "QC final" sheet, as long as the "designated" value has passed QC, delete the collocated entry. If the "designated" value has not passed QC, delete it and replace it with the "collocated" value.

40. Scan the spreadsheet and remove remaining boxes or underlines.

41. Sort again by site, sample date, sampler to reorganize any changes made and put all asterisks at the bottom. Remove colors, scan through page preview, remove any extraneous columns (e.g., Random count, date check). Delete all asterisks at the bottom of the sheet. Then print.

42. Insert two worksheets, named "data submittal standard" and "data submittal actual" and copy the corrected sheet onto both.

43. Remove the appropriate column, either Standard or Actual PM-10 values from the respective sheets.

44. Delete all columns and rows except Site, Sampler, Sample Date, PM-10 Standard, and PM-10 Actual. Do not delete column headings yet.

45. Print the sheets for inclusion in the QC book.

46. Then delete the column headings.

47. Complete and print the final QC statistics for inclusion in the QC binder. Route this for initials before submittal and filing.

48. Make a new file with the following tabs and save it as PM10Q32002QCSubmittal and Email the precision sheet, QC statistics, null data sheet, and the data submittals to Barbara Trost, DEC at barbara_trost@envircon.state.ak.us and put the sheet(s) in the PM-10 QC records binder.

49. Right justify all data submittal columns and make sure their column widths are all the same (so SAS does not have trouble converting them to AQS)

50. Submit the final data to the Air Quality Program Manager for AIRS coding and submittal.

51. On a yearly basis in July, or whenever necessary, update this SOP and add a comment to that effect to the QC Statistics report page for submittal to DEC.

8.1.1 Quarterly

1. Each quarter the monthly summary reports, will be submitted to the Quality Assurance Officer along with a spreadsheet that identifies and explains periods of invalid dates. This is known as the invalid data justification file. All reports must be submitted no later than the 15th of the following month. If the report cannot be submitted on time notify the Quality Assurance Officer and the Environmental Quality Program Supervisor immediately and make arrangements for submittal.

2. The Quality Assurance Officer will review the report, validate the data utilizing all Quality Control and Quality Assurance information, seek correction of any identified errors, and will send it to the EQ Program Supervisor for submittal to the Alaska Department of Environmental Conservation (ADEC), Division of Air Quality.

8.2 Final Data Validation

Data that have been reviewed by the Quality Assurance Officer and found to satisfy the requirements of this procedure and the criteria set forth in the Municipality of Anchorage Air Monitoring Quality Assurance Plan will be certified as valid.

8.3 Data Reporting

After the data are edited and validated, the AAPCA Supervisor or his designee will submit the data to the ADEC.

9 Reference

United States Environmental Protection Agency. April, 1989. Reference Method for the Determination of Particulate Matter as PM10 in the Atmosphere (High-Volume PM10 Sampler Method).

Appendix I - Forms

Blank data forms are provided on the following pages for the convenience of the manual user.

PM-10 MOA MFC Sampler Field Calibration Sheet can also be found on the server at:
G:\ESD\Aq\AIR_DATA\PM10\ Pm10 MTR Calibration Form.xls

PM-10 High Volume Scheduled Maintenance and QA/QC Items can also be found on the server at:
G:\ESD\Aq\AIR_DATA\PM10\ PM-10HiVolMaintQASchedule.xls

MOA PM-10 Data Sheet can also be found on the server at:
G:\ESD\Aq\AIR_DATA\PM10\ MOA PM10 Data Sheet

The Municipality of Anchorage Log Book Form can also be found on the server at:
G:\ESD\Aq\AIR_DATA\PM10\PM10SHT

Calibration and Verification Check Intervals

	Frequency	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Acceptance Criteria
Flow Rate Verification/ Single Point Check	Monthly													Valid if ± 10% of the Transfer Standard Adjust if > ± 6% Diff
Temperature Verification	Monthly													± 4 °C of Standard
Mechanical Timer Verification	Monthly													± 2 min./24 hrs
Elapsed Timer Verification	Monthly													± 30 min./24 hrs
Pressure Verification	Quarterly													± 5 mm Hg.
Leak Check	Monthly													
Clean PM-10 Inlet	Monthly													
Clean impaction plate	Monthly													

PM-10 Calibration and QC Check Data Sheet

Station # _____ Date: _____

Location: _____ Time: _____

Monitor # _____ Operator: _____

Thermometer Serial # _____

- Certification Date: _____

Barometer Serial # _____

- Certification Date _____

Barometer Field Standard Serial # _____

- Check Date _____

Flow Standard Serial # _____

- Certification Date: _____

QC Check

Temperature Check
Ambient

Actual _____ ^{o}C Indicated _____ ^{o}C Difference _____ ^{o}C

Pressure Check

Actual _____ mm Hg Indicated _____ mm Hg Difference _____ mm Hg

Flow Check

Actual _____ m^3/min Indicated _____ m^3/min % Difference _____ %

QC % Difference = $\left[\frac{Ind - Act}{Act}\right] \times 100$

Time Check

Actual Time _____ Indicated _____ Difference _____

Add copy of this completed form to the data QA file.

PM10 MOA MFC Sampler Field Calibration Sheet

Date _____ Time _____

Site _____

Sampler # _____ Motor No. _____

Ta ^{o}F= _____ ^{o}C= _____ Seasonal T _____

Pa " Hg _____ mmHg= _____ Seasonal Pressure _____

Ta+30 _____ K

Oriface Cal.: m= _____ b= _____ r2= _____

Oriface I.D. _____ Oriface Calibration Date _____

Single Point: F.C. _____ Plenum _____ Oriface _____

		Orifice Pressure	*Plenum Pressure*	*Q actual*	*P ext.*
V	100				
A	90				
R	80				
I	70				
A	60				
C	50				
	40				
	30				

Pext=(sqrt(Plenum Mano Read)*((Ta+30)/Pa))) Pext=m (Qact) +b

Qact=(m*(sqrt(Oriface Mano Read*(Ta/Pa))))+b

slope(m)= b= _____ R2= _____

Calibrated by: _____

Set point flow rate _____

Sampler setpoint
(oriface P) _____

MOA PM10 Data Sheet

Site	
Sampler #	
Sample Date	/ /
Motor	
Pre Date	/ /
Mano (i)	.
Post Date	/ /
Mano (f)	.
Elapsed Time(min)	
Filter #	
Post Weight	**4.**
Pre Weight	**4.**
Mass (ug)	**0.**
Pre Flow Q Actual	**1.**
Post Flow Q Actual	**1.**
Pre Flow Q Stand.	**1.**
Post Flow Q Stand.	**1.**
% Dev. From 1.13	**%**
Vol Standard 24hr	**1**
PM 10 (ug/m^3) 24 hr	
Date Weighed	/ /
% RH	
Temp ^oF	

MUNICIPALITY OF ANCHORAGE
Department of Health and Human Services
Air Quality Program
LOG BOOK FORM

PM-10 Data for _____ Site

Date	Day	Motor #	Shelter	Filter #	PM-10	Run #