Standard Operation Procedures for Met One SuperSASS PM2.5 Speciation

In Use By

Polk County Air Quality
Ambient Air Monitoring Personnel

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PREPARED BY

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POLK COUNTY AIR QUALITY DIVISION STANDARD OPERATING PROCEDURE MANUAL FOR THE MET ONE SUPERSASS PM2.5 SPECIATION MONITORING

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29.0 STANDARD OPERATING PROCEDURE FOR PM2.5 SPECIATION SAMPLING USING MET-ONE SUPERSASS SPECIATION SAMPLER

29.1 Purpose

To establish a standard operating procedure (SOP) for Polk County Ambient Air Quality personnel to ensure proper collection of PM 2.5 speciation samples when operating the Met One SuperSASS Speciation Sampler.

29.2 Scope

This section describes the routine field operations for the Met One SuperSASS PM2.5 Speciation Sampler. This SOP is to be used as an outline and is not intended to replace the equipment manufacturer's manual or procedures. Routine operations are defined as those performed on a monthly, or more frequent, basis.

29.3 References

29.3.1 Field Operation Manual Model SASS & Super SASS PM2.5 Ambient Chemical Speciation Samplers. Met One Instruments, Inc. Document No. SASS-9800 Rev. D. December 27, 2001.

29.3.2 Particulate Matter (PM2.5) Speciation Guidance, Final Draft, USEPA, October 7, 1999.

29.3.3 Guideline on Speciated Particulate Monitoring, Draft 3, USEPA, August, 1998.

29.3.4 Quality Assurance Guidance Document, PM2.5 Speciation Trends Network Field Sampling, USEPA, June 2000.

29.3.5 Quality Assurance Guidance Document, Final, Quality Assurance Project Plan: PM2.5 Speciation Trends Network Field Sampling, December 2000.

29.3.6 Research Triangle Institute, Draft Data Validation Process for the PM2.5 Chemical Speciation Network, RTI/07565/12-01F, July 5, 2000.

29.3.7 UX-961 Data Transfer module Operations Manual. Met One Instruments, Inc. Rev. A. February 2, 2001.

29.3.8 Field Temperature Calibration Procedure. Met One Instruments, Inc., Rev. A, March 29, 2001.

29.3.9 40 Code of Federal Regulations (CFR) Part 58, Appendix A, Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS).

29.4 Introduction

The SuperSASS (Speciation Air Sample System) chemical sampler was developed under contract from the United States Environmental Protection Agency by Met One Instruments. The SuperSASS collects samples for the chemical and gravimetric analysis of ambient air PM2.5 particles. PM2.5 refers to those airborne particles with diameters smaller than 2.5 μm. These particles are comprised of sulfates, nitrates, organic carbon, soot-like carbon and metals.

Ambient air enters the SuperSASS through each of the selected active canisters mounted within the solar radiation shield. Particles larger than 2.5 μm aerodynamic diameter are removed by the cyclonic inlet mounted with each canister. Remaining PM2.5 particles are collected on the filter media installed within each canister. Canisters may be equipped with a diffusion denuder ahead of the filter to remove selected gaseous compounds.

The SuperSASS accommodates eight sampling canisters used in groups up to four. Each individual canister has its own PM2.5 sharp cut cyclone (SCC) inlet, denuder ring and tandem 47 FRM filter holders. Each canister contains all necessary components for excluding particles above 2.5 μm, for removing interfering gases, and for collecting ambient fine particles.

29.5 Sampler Set-up

The SuperSASS monitor has specific physical requirements that should be considered prior to installation. The tripod and sampling system operate at approximately 72 inches above the ground or sampling platform. It is very important to anchor the tripod securely to prevent damage in strong winds or weather.

Specifications for siting a SuperSASS can be found in USEPA's Documents: Particulate Matter (PM2.5) Speciation Guidance and Guideline on Speciated Particulate Monitoring.

29.5.1 Inspecting New Equipment

Upon receipt of the Met-One SuperSASS, visually inspect it to ensure that all components are accounted for. Inspect the instrument for external physical damage due to shipping, such as scratched or dented panel surfaces and broken knobs or connectors.

Inspect the instrument for damage, such as broken components or loose circuit boards. If no damage is evident, the monitor is ready for installation, calibration and operation. If any damage due to shipping is observed contact the manufacturer for instructions on how to proceed.

Notify Met One Instruments immediately if any equipment is missing or damaged. Repack it in the same way it was delivered.

29.5.2 Set-Up of New Equipment

29.5.2.1 Tripod Installation

Remove the 3 ringed pins from the tripod leg bracket and fold down the three (3) legs of the tripod. The 3 pins are then re-inserted to hold the three legs in position. Anchor the tripod to the sampling platform using commercial hardware (deck screws, etc.) to prevent damage in strong wind or weather. Holes are provided in the tripod feet.

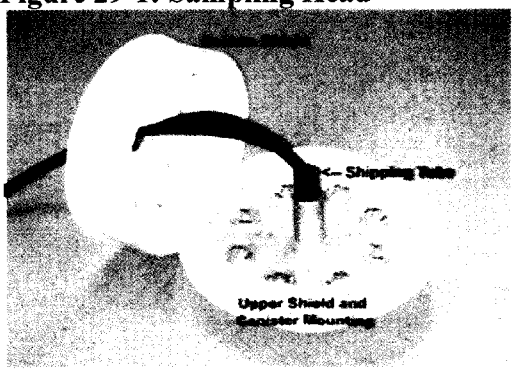
29.5.2.2 Sampling Head Installation

Locate the bottom shield of the sample head. It is in the top portion of the sampling head and is easily identified by the 8 holes in the flat portion. Lift the bottom shield off the rest of the sampling head, letting the hose and cable slide through the hub at the center of the shield. Remove the shipping tube.

Pull the pin from the hub letting it hang by its chain. Slide the shield down onto top of mast and allow it to rest on the leg weldment. Use an Allen wrench and install two 8-32 x 3/16" long socket head cap screws in the top area.

Stretch out and unwind the cable with connector and tubing bundle coming from the hub of the upper sampling head. While supporting the sampling head, feed the bundle into the top of the mast and mount the hub onto the mast. Engage the notch in the hub with the topmost screw head to properly align unit. Tighten two (2) setscrews to secure sampling head to mast. Raise the bottom shield to the stop position. Align the slot with the screw head in mast and pin in place, while installing the next portion of the SuperSASS unit.

Figure 29-1: Sampling Head



29.5.2.3 Control Unit Installation

Mount the control unit using two metal mounting brackets and two sets of U-Bolt hardware clamps. Proper orientation of the control box is with the hinged side of the box facing the left and all cable connections are facing the ground or platform in the middle of two legs of the tripod. Once the unit is positioned tighten the U-Bolt hardware clamps using a 7/16" nut driver.

Figure 29-2: Control Unit and Ambient Temperature Sensor

29.5.2.4 Ambient Temperature Sensor Installation

Attach the shield and temperature sensor assembly using one (1) U-Bolt and the two 7/16"nuts with washers. The temperature shield is mounted above the lower mounting bracket of the control unit. Place the ambient temperature sensor on the mast with the flat top plate facing up and the cable connector facing the ground. Lower the sensor until the mounting bracket hits the top of the bottom bracket of the control unit. Position the ambient temperature sensor so the shields face the back of tripod. When positioned secure the sensor by tightening the two 7/16" hardware nuts and Washers using a nut driver.

29.5.2.5 Pump Box Installation

Place the vacuum pump box between the legs of the tripod. Secure the vacuum pump box to the deck surface. Attach the cable from the vacuum pump box to the connector on the ambient temperature sensor. Connect the other cable from the vacuum pump box to the center connector on the control unit. Connect the power cord to a ground electrical outlet. Connect the multi-pin connector on the side of the pump box to the multi-conductor cable that runs down from the sampling head assembly. Connect the vacuum lines coming from the sampling head assembly to

the designated number connection on the vacuum pump box (quick-disconnect valve connectors).

Figure 29-3: Vacuum Line Connections to Pump Box

Secure all lines with tie wraps.

29.5.3 Setup of Sampler

When powering up the sampler, the Home Menu screen, (Default Screen) should appear.

Figure 29-4: Home Menu Screen

```
        SASS Speciation Sampler
                V 4.02
        Met One Instruments, Inc
             www.metone.com
                              Transfer
  Event    Setup  Calibrate     Data
```

Adjust contrast using the * key on the Control Box keypad.

29.5.3.1 Clock Setup

From the Home Menu screen, press the **Setup** button to go to Setup Menu and then press the **F3** button to get to the Clock Setup Screen.

Figure 29-5: Clock Setup Screen

```
   Clock Setup     12/24/00 11:10:35
       MM/DD/YY
Date:  12/24/00

       HH:mm:ss
Time:  11:30:22
   Set                            Exit
```

Use the left and right arrow keys to move to the values of MM/DD/YY or HH:mm:ss that need to be changed. Then use the up and down arrow keys to change the current values to the current date and time. Once completed, press the **Set** button and the newly entered values will be entered as the new default values. Press the **Exit** button to return to the Setup Menu Screen.

Press the **F2** button for the Default Setup Screen. Use the left and right arrow keys to move to the values of HH or mm that need to be changed. Then use the up and down arrow keys to change the current values to the typical value used for all sample collection. Once completed, press the **Save** button and the newly entered values will be entered as the new default values and you will return to the Setup Menu.

29.5.3.2 Sampler ID Setup

Press the **F4** button for the ID Setup Screen. Use the up and down arrow keys to change the current values to the new ID value (Sampler Serial Number). Once completed, press the **Save** button and the newly entered values will be entered as the new ID. To turn on the back light, use the arrow keys to change from off to on. Press the **Save** button to save responses. Press the **Exit** button to return to the Setup Menu. Press the **Exit** button again to return to the Home Menu screen. Installation of the Met One SuperSASS sampler is complete. The sampler must be calibrated for flow rate, temperature (ambient and filter), and barometric pressure using a NIST-traceable standards.

29.6 Standards

29.6.1 Transfer Standards

Transfer standards are used to calibrate the station "field" samplers and to perform verifications. Instruments designated as transfer standards are used so the primary standard can remain at a fixed laboratory location where conditions can be carefully controlled and damage to the instrument minimized. Transfer standards are calibrated against the higher-level, primary standards. All transfer standards must be accompanied by the following:

- The manufacturer's manuals for the instruments
- A logbook including a complete chronological record of all certification and recertification data as well as all sampler calibrations carried out with the transfer standard
- A complete listing and description of all equipment, materials, and supplies necessary or incidental to the use of the transfer standard
- A complete and detailed operational procedure for using the transfer standard, including all operational steps, specifications and quality control checks

29.6.2 Audit Standards

Audit standards are used to challenge the station "field" sampler and to perform accuracy checks on a quarterly basis. Audit standards are calibrated against the higher-level, primary standards. All audit standards must be accompanied by the following:

- The manufacturer's manuals for the instruments
- A logbook including a complete chronological record of all certification and recertification data as well as all sampler calibrations carried out with the audit standard
- A complete listing and description of all equipment, materials, and supplies necessary or incidental to the use of the audit standard
- A complete and detailed operational procedure for using the audit standard, including all operational steps, specifications and quality control checks

29.6.3 Qualification, Certifications and Recertification

Qualification consists of demonstrating that the transfer and audit standards are sufficiently stable (repeatable) to be useful as a transfer standard. Repeatability is necessary over a range of variables such as temperature, line voltage, barometric pressure, elapsed time, operator adjustments, or other conditions, any of which may be encountered during use of the transfer standard. After a transfer and audit standard has been shown to meet the qualification requirements, certification is required before it can be used.

29.7 Equipment, Maintenance and Trouble Isolation

There are several routine duties that must be performed each time an air monitoring station is inspected. These duties include equipment inspection, performing calibrations, assisting during audits, documentation, and making neccssary adjustments or repairs to the instruments.

29.7.1 The Monitoring Station

It is the operator's responsibility to maintain the monitoring station. Routine maintenance includes keeping site clean and being observant of potential problems. Examples of potential problems include:

- Accumulation of dirt and debris
- Infestation by rodents or insects
- Overgrowth of vegetation around the site

29.7.2 Preventative Maintenance

As part on the normal maintenance and operation, the various components of the system should be inspected for wear, damage, and changes in previous operation. Most inspections rely on visual checks during normal operation of the system. These should be performed each time anything is done to the system. Some minor but critical maintenance procedures are as follows:

29.7.2.1 Pump

The SuperSASS utilizes a dual headed Thomas diaphragm pump. It is recommended that pump be rebuilt or replaced once per year. Ideally, pumps will be serviced in the fall, so they will operate at maximum efficiency throughout the winter. Pumps may be rebuilt, but should be replaced after several rebuilds.

29.7.2.2 O-Rings

The O-rings used in the SuperSASS are made from Viton rubber. If leaks are detected during operation or during leak check procedures, these O-rings could be leaking. It is recommended to replace O-rings every two to three years.

29.7.3 Trouble Isolation

The instruments in Polk County Air Quality's air monitoring network are very reliable. However, after a period of continuous use problems may occur. Leaks in the system, dirt build up and pump failure are typical. After time, the operator should be able to quickly distinguish the symptoms and causes of equipment failure.

It is suggested that each station operator consult the **Met One Instruments Operator's Manual** and compile personal notes on troubleshooting as they gain experience with the SuperSASS. The operator is encouraged to contact the manufacturer when attempting any repairs.

The manufacturer's manual is the best resource the station operator has for the information on the operation and maintenance of the SuperSASS.

29.7.4 Leak Check Procedures

If the leak check is above 0.1 LPM, check the system to determine the leak. Test individual sections of the system that can be identified as the location of the leak. Disconnect the vacuum line from the sample head at the side of the pump box. The flow for that channel should drop to 0.0 SLM. This indicates that the leakage path is between the pump and the sample head.

Reconnect the vacuum line to the pump box. Remove the canister from the sample head, and block off the vacuum line connection that would have inserted into the module. One of the yellow cap plugs supplied on the canisters can be used for this. If the flow value drops to 0.0 SLM, then the leakage is either in the connection between this point and the canister or the sharp cut cyclone (SCC).

Remove the SCC from the module and plug the bottom of the module with one of the yellow cap plugs. Install the module in the sample head and examine the flow value. It should drop to 0.0 SLM. If a leak is detected, then the seal between the sample head and the module is at fault. Check to see if the O-rings are in good condition. The other possibility is that the module is not correctly assembled and a leakage path around the two sections of the module exists. A 0.0 SLM reading would indicate the problem is in the SCC.

Replace the SCC on the module. If the flow channel indicates a leak, then the problem is with the SCC. Verify that the O-ring seals on the SCC are intact and have not been damaged. If they are cut or have any other type of damage, they must be replaced. If the flow reads 0.0 SLM then the problem is fixed, and there is no leakage in the system.

If these steps do not correct an apparent leak problem contact Met One.

29.8 Quality Assurance (Accuracy-Audits)

Each of the operating SuperSASS samplers will be audited once during each calendar quarter by the designated Quality Assurance Officer utilizing the procedures and calculations specified in 40 CFR 58, Appendix A, "Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)."

Perform audits as described by procedures outlined in Section 29.10.2, Monthly Verifications, of this SOP. Table 29-1 outlines the activities to be audited and their acceptable criteria. All steps are to be recorded on the Audit Field Sheet, Form 1, Appendix A.

Audits should be conducted in the same way as the routine verifications performed once every month with the following exceptions:

- Audits must be done using standards that are not used for routine calibrations and checks, and should be done by someone other than the routine operator. For example, a special BIOS Dry-Cal is used for flow audits.

- There are no acceptance criteria for a single audit, and therefore, data cannot be invalidated based on audit results alone. However, an investigation initiated by audit results that are outside the limits of relevant acceptance criteria, may point to other factors which require data invalidation.

- Audit results are not uploaded to AIRS. The audit results are kept on file in house and are available to the public upon request.

Table 29-1 Audit Activities and Acceptance Criteria

Activity	Acceptance Criteria
One Point Flow Rate Audit	± 10% of the Audit Standard
Ambient Temperature Sensor Audit	± 2°C of Standard
Ambient Pressure Sensor Audit	± 10 mm Hg
External Leak Audit	< 0.1 LPM

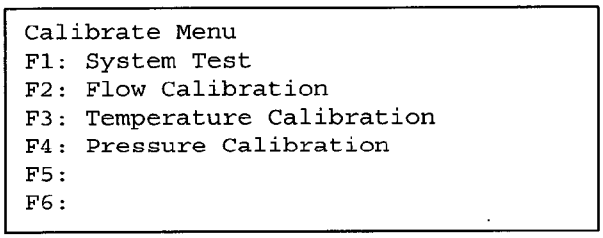
29.9 Calibrations-Temperature, Pressure and Flow

29.9.1 Temperature Calibration

Calibration of the temperature sensors is to be performed upon installation, annually or when monthly verifications indicate a deviation greater than ±2°C from the actual temperature as determined by an NIST traceable thermometer. The NIST thermometer must be recertified annually.

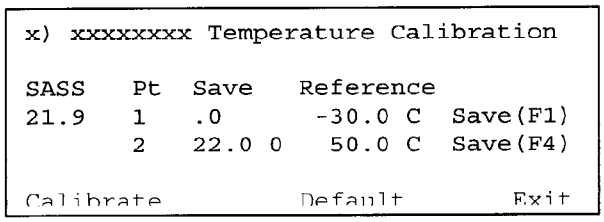
From the Home Menu, press the **Calibrate** button to advance to the Calibration Menu (Figure 29-6).

Figure 29-6: Calibration Menu Screen



At the Calibration Menu, select the **F3** button for the Temperature Calibration Screen (Figure 29-7).

Figure 29-7: Temperature Calibration Screen



29.9.1.1 Ambient Temperature

Prepare a large enough slurry of distilled water and ice chips to produce a 0°C temperature and insert a NIST Traceable filter temperature probe from and the ambient temperature probe of the sampler. Remove the ambient temperature probe from the shield by removing the three hexagonal nuts.

Now with the ice point bath, immerse the ambient temperature probe. After the temperature

stabilizes, measure values of SuperSASS ambient temperature and the reference temperature Standard.

Use the arrow keys to advance to the Reference Point 1. When the probes are stable, enter the value measured from the temperature standard in the top reference window. When completed press the **F1** button to save this value.

Now insert the probe in the heated water mixture or ambient temperature conditions and allow time for the probe and the reference thermometer to stabilize. Use the arrow keys to advance to the Reference Point 2. When the probes are stable, enter the value measured from the reference thermometer in the second reference window. When completed press the **F4** button to save this value.

Now press the **Calibrate** button and the new values will be saved in memory of the control unit. Press the **Exit** button to return to the Calibration Menu screen.

Record the responses of the sampler's ambient temperature probe and the reference temperature standard readings on the Calibration Field Sheet, Form 2, Appendix A. The ambient temperature should be within ±2°C of the reference temperature standard.

Reinstall the ambient temperature probe in the solar radiation shield. This concludes the ambient temperature calibration. Proceed to the filter temperature calibration.

29.9.1.2 Filter Temperature

From the Calibration Menu, press the **F3** button for Temperature Calibration. Use the arrow keys to go to filter temperature calibration screen. Insert the temperature standard probe into the open sample orifice of Channel 1 and allow enough time for the temperature reading on the temperature standard display to stabilize. For calibrating filter temperatures, use current ambient conditions as the temperature value. Use the arrow keys to advance to the Reference Point 1. When the probes are stable, enter the value measured from the temperature standard in the top reference window. When completed, press the **F1** button to save this value. Now press the **Calibrate** button and the new values will be saved in memory of the control unit. Record the filter temperature for Channel 1 and the reference temperature standard reading on the Calibration Report Form. The temperature should be within ±2°C of the reference temperature standard reading. Remove the temperature standard probe from Channel 1 of the SuperSASS sampler.

NOTE: The Met One SuperSASS has a temperature sensor in each of the 8 channels. Each individual sensor needs to be calibrated.

Continue the same procedure for the remaining seven channels.

29.9.1.3 SuperSASS Temperature Calibrator

Met One manufacturers the SuperSASS Temperature Calibrator (9099). The Calibrator provides a convenient means for performing a field calibration, as an alternative method to the standard temperature bath calibration. The Calibrator performs a multi-point temperature calibration using a resistor box to simulate the output of a thermister-type temperature sensor.

The resistance used in this unit holds a 0.01% tolerance to insure accuracy, and represents the known temperature standard values of: -30°C, +10°C, and +50°C.

From Calibration Menu, press the **F3** button to advance to the Temperature Calibration Screen.

With the Ambient Temperature Sensor removed from the cable, connect the Ambient Temperature Cable to the Top connector on the switched resistance box. Disconnect the Sampling Head Cable from the Pump box, and connect the switched resistance box cable in its place.

Use the arrow keys to select the ambient or filter temperature to be calibrated. Select -30°C with the temperature selector knob, and wait for the measurement to stabilize. Press **F1** to save the -30°C value. Move the temperature selector knob to +50°C, and wait for the measurement to stabilize. Press **F4** to save the +50°C value. Press the **Calibrate** button to store the calibration data.

Move the temperature selector knob to +10°C, and wait for the measurement to stabilize. If the sampler reading does not agree within +/-1°C of the calibrator, repeat the calibration. If the readings continue to be erroneous, contact the Met One Instruments Service Department.

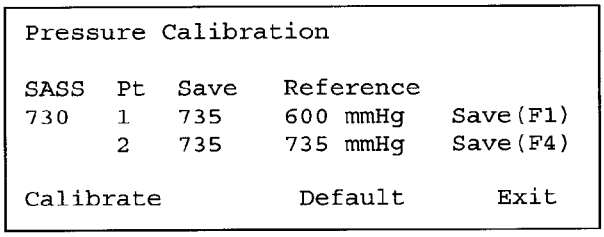
Repeat Calibration procedure for all 8 filter channels. Record all information on the Calibration Report Form. When all temperature calibrations are complete, press the **Exit** button to return to the Calibration Menu screen.

For a more detailed explanation of temperature calibration procedures, consult Met One Instruments "Field Temperature Calibration Procedure".

29.9.2 Pressure Calibration

At the Calibration Menu, press the **F4** button to advance to the Pressure Calibration Screen (Figure 29-8).

Figure 29-8: Pressure Calibration Screen



Normally, two points are used to conduct pressure calibration at 600 and 800 mm Hg. Several regional laboratories are unable to perform these two points. Therefore, the operators are requested to conduct a one-point calibration (ambient conditions).

NOTE: Polk County will follow EPA's recommendations to allow Met-One to perform all pressure calibrations due to the complexity of the process. A one-point pressure verification will be performed.

Set the pressure standard on the vacuum pump box.

Record the ambient barometric pressure from the reference pressure standard and the SuperSASS on the Calibration Field Sheet. The barometric pressure should be within ±10 mm Hg of the pressure standard reading.

If the barometric pressure of the SuperSASS sampler does not agree with the reference standard, contact Met-One for service.

Press the **Exit** button to return to the Calibration Menu screen. This concludes the barometric pressure calibration. Proceed with the leak check and flow rate calibration.

29.9.3 Leak Check/Flow Calibration

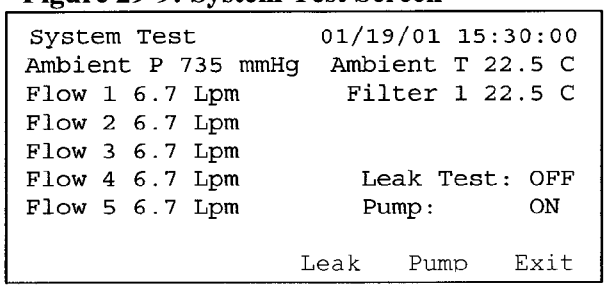
Flow calibrations are to be performed upon installation, annually or when monthly verifications indicate a deviation greater than ±10% from the actual flow as determined by an NIST traceable flow meter. The NIST flow meter must be recertified annually.

Always perform a leak check prior to a flow calibration.

Lower the weather shield on the Met-One SuperSASS sampler from its ready position. Attach sharp cut cyclones (SCCs) to calibration modules (#1 Teflon, #2 nylon, #3 quartz, and #4 nylon). Attach calibration modules with cyclones to sampling ports on the SuperSASS sampler. Make sure modules are connected to the proper sampling port (Teflon, nylon, or quartz) and are secure.

From the Home Menu, press the **Calibrate** button for the Calibration Menu. Select the **F1** button to advance to the System Test Screen (Figure 29-9).

Figure 29-9: System Test Screen



Press the **Pump** button to turn on the pump. When the pump key has been chosen, a warning will come up and ask if you want to continue or cancel the run. Push the **Continue** button and the pump will start.

When flow rate stabilizes, press the **Leak** button to conduct the leak check test. Use either a finger or a cap to tightly seal the inlet of the SCC so that no air can pass up through the nozzle. Allow the system to stabilize at a constant flow rate. A flow rate of 0.0 LPM, indicates there is no leak in the flow system. A leak of up to 0.10 LPM will pass the acceptance criteria. If the leak check is above 0.1 LPM, check the system to determine the leak, see Section 29.7.4.

Slowly release the vacuum on the Channel 1 inlet, and move to the next three consecutive channel

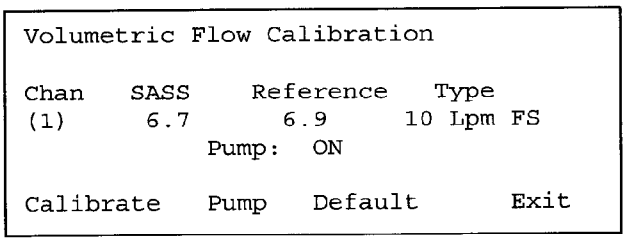
positions (Channels 2, 3, and 4) in succession to perform leak checks.

Record the leak flow rate for each channel from the System Test Menu on the Calibration Field Sheet.

Press the **Leak** button to shut off the pump. Press the **Exit** button to return to the Calibration Menu screen. Following all leak checks, proceed with the flow calibrations.

Using the BIOS DC-Lite and tubing, attach the tubing to the cyclone on the #1 Teflon audit module (Channel 1). Press the **F2** button to proceed to the Flow Calibration Screen (Figure 29-10).

Figure 29-10: Flow Calibration Screen



Press the **Pump** button to turn on the pump. Allow the flow to stabilize, use the arrow keys to advance to the Reference Point. Type the flow rate from the flow standard in the SuperSASS, and press the **Calibrate** button. Allow the SuperSASS value to equilibrate to the reference standard value. Record the displayed SuperSASS sample flow rate for Channel 1 and the flow rate displayed on the flow standard on the Calibration Report Form.

Use the arrow keys to move to Channel 2. Repeat calibration procedures. Use the arrow keys to move through the remainder of channels.

Press the **Pump** button to shut off the pump. Press the **Exit** button to return to the Calibration Menu screen. Press the **Exit** button to return to the Home Menu. This concludes the flow rate calibration.

29.10 Sampler Operations

This section describes the routine field operations for the Met One Instruments SuperSASS. Routine operations are defined as those performed on a monthly, or more frequent, basis.

29.10.1 Quality Control

29.10.1.1 Temperature Check

Perform a temperature verification at least once every month or as needed. Sampler measured (current) temperature must be within ±4°C of the temperature measured by an external transfer standard. However, any time the sampler temperature differs by more then ±2°C from the transfer standard, a calibration must be performed, see Section 29.9.1 of this SOP. Failure to meet the ±4°C criteria may result in the invalidation of data back to the last successful temperature verification.

29.10.1.2 Pressure Check

Perform an ambient pressure verification at least once every month or as needed. Current ambient pressure must be within ±10 mmHg of actual ambient pressure. Failure to meet this criteria may result in the invalidation of data back to the last successful pressure verification.

Converting inHg to mmHg: inHg x 25.4 = mmHg

29.10.1.3 Leak Check

Perform a leak check at least once every month or as needed. If a leak value is measured at greater than 0.1 LPM, data will be invalidated back to the last successful leak check.

29.10.1.4 Flow Check

Perform flow rate verification at least once every month or as needed. A one-point flow verification is subjected to the following 2 checks:

- Percent difference from "Sampler":
  [(Sampler-Actual)/Actual] x 100 < ±10 %
- Percent difference between sampler set flow and sampler flow:
  [(Sampler-Set Flow (6.7))/6.7] x 100 < ±10%

Failure to meet any of these criteria will result in the invalidation of data back to the last successful flow verification.

29.10.1.5 Maintenance

- Sampling head assembly should be cleaned at least once every 4 weeks or as needed.
- The SCC for PM2.5 must be cleaned at least once every 4 weeks or as needed.

Table 29-2 Verification, Calibration and Maintenance Check Intervals

Activity	Frequency	Acceptance Criteria
Temperature Verification	Monthly	± 2°C of Standard
Temperature Calibration	Annually or as needed	± 2°C of Standard
Pressure Verification	Monthly	± 10 mm Hg of Standard
Pressure Calibration	Annually or as needed	± 10 mm Hg of Standard
Leak Check	Monthly	≤0.1LPM
Flow Verification	Monthly	± 10% of Standard
Flow Calibration	Annually or as needed	± 10% of Standard
Cleaning of SCC	Monthly	
Clean Sampling Head	Monthly	

29.10.2 Monthly Verifications

At a minimum, perform verifications and leak checks at the frequency listed in the Quality Control Section 29.10.1 of this SOP.

29.10.2.1 Clock

From Main Menu screen, select the Setup Menu and then press **F3**. Record time on Verification Field Sheet, Form 3, Appendix A. Record NIST traceable time--Cell phone, GPS, atomic watch on Verification Field Sheet (record local standard time—beware of daylight saving time). Press

Exit button twice to exit menu back to the Main menu.

29.10.2.2 Ambient Temperature

From the Calibration Menu, Press the **F3** button to proceed with the Ambient Temperature Verification. Carefully insert the temperature probe into the temperature shield of the SuperSASS ambient temperature sensor, avoiding direct sunlight. Allow the temperature standard reading to stabilize. Record the SuperSASS sampler ambient temperature and the temperature standard ambient temperature on the Verification Field Sheet.

29.10.2.3 Filter Temperature

From the Calibration Menu, Press the **F3** button to proceed with the Filter Temperature Verifications. Insert the temperature standard probe into the open sample orifice of channel 1 and allow enough time for the temperature reading on the temperature standard display to stabilize. Record the filter temperature for channel 1 and the displayed temperature reading from the temperature standard on the Verification Field Sheet. Use the arrow keys to display the Filter Temperature for Channel 2. Follow this procedure until all eight Filter Temperatures have been verified.

29.10.2.4Barometric Pressure

From the Calibration Menu, press the **F4** button to advance to the Pressure Calibration Screen. Set the pressure standard on the vacuum pump box. Record the ambient barometric pressure from the pressure standard and the SuperSASS on the Verification Field Sheet. The barometric pressure should be within ±10 mm Hg of the pressure standard reading.

29.10.2.5Leak Checks

Lower the weather shield on the Met-One SuperSASS sampler from its ready position. Attach sharp cut cyclones (SCCs) to verification modules (#1 Teflon, #2 nylon, #3 quartz, and #4 nylon). Attach verification modules to sampling ports on the SuperSASS sampler. Make sure modules are connected to the proper sampling port (Teflon, nylon, or quartz) and are secure.

From the Home Menu, press the **Calibrate** button for the Calibration Menu. Select the **F1** button to advance to the System Test. Press the **Pump** button to turn on the pump. When the pump key has been chosen, a warning will come up and ask if you want to continue or cancel the run. Push the **Continue** button and the pump will start.

When flow rate stabilizes, press the **Leak** button to conduct the leak check test. Use either a finger or a cap to tightly seal the inlet of the SCC so that no air can pass through the nozzle. Allow the system to stabilize at a constant flow rate. A flow rate of 0.0 LPM, indicates there is no leak in the flow system. A leak of up to 0.10 LPM will pass the acceptance criteria. If the leak check is above 0.1 LPM, check the system to determine the leak Section 29.7.4.

Slowly release the vacuum on the Channel 1 inlet, and move to the next three consecutive channel positions (Channels 2, 3, and 4) in succession to perform leak checks.

Record the leak flow rate for each channel from the System Test Menu on the Verification Field Sheet.

Press the **Leak** button to shut off the pump. Press the **Exit** button to return to the Calibration

Menu screen. If leak checks passed, proceed with flow verifications.

29.10.2.6 Flow

Using the BIOS DC-Lite and tubing, attach the tubing to the cyclone on the Channel 1 verification module. Press the **F2** button to proceed to the Flow Verifications. Press the **Pump** button to turn on the pump. Allow the flow to stabilize. Record the displayed SuperSASS sample flow rate for Channel 1 and the flow rate displayed on the flow standard on the Verification Field Sheet.

Use the arrow keys to move to Channel 2. Repeat verification procedures. Use the arrow keys to move through the remainder of channels.

Press the **Pump** button to shut off the pump. Press the **Exit** button to return to the Calibration Menu screen. Record the results of the flow verifications on the Verification Field Sheet.

Note: If a problem is recognized while performing any maintenance, diagnostic, external, or internal checks which has or could affect data a corrective action form is to be filled out describing the problem identified and the action taken to correct the problem. All information should be recorded on a Corrective Action Form, Form 4, Appendix A.

29.10.3 Procedures

New station operators will be provided with on-site training by an experienced operator before they operate a station on their own. The following procedures are intended to assist the operator in performing and documenting monitoring procedures. Monitoring personnel must become familiar with the Met One Instruments SuperSASS Speciation Monitor Operation Manual.

The following materials are required:

- SuperSASS control unit (8863)
- Pump box (8862-2)
- Tripod (8864)
- Sampling head and canister mounting (8861-2)
- Modules (or canisters) (8370)
- PM2.5 Sharp Cut Cyclone (SCC) inlet (8670)
- MgO Denuder (8382)
- 47 mm FRM filter
- Ambient temperature sensor (064-1)
- Temperature shield (5980)
- SuperSASS Temp Calibrator (9099)
- NIST traceable flow meter (flow standard)
- NIST traceable barometer (pressure standard)
- NIST traccable thermometer (temperature standard)
- Data Transfer Module (UX-961)
- 9 to 9 pin RS232 cable
- Field sheets
- Station logbook

• Cotton swabs

29.10.3.1 The Sample Module

Each module is set up for different sampling techniques required for analyzing the different chemical constituents of PM2.5. Each sample module contains the following components:

- Sharp cut cyclone at 6.7 LPM to remove particles larger than 2.5 μm aerodynamic diameter.
- Denuder to remove nitric acid or other interfering gases, or an empty denuder ring.
- 47mm Front filter for particle capture
- 47mm Tandem or backup filter, as needed.
- Cover to hold and protect the components

29.10.3.1.1 Sharp Cut Cyclone

The SuperSASS sample module contains a sharp cut cyclone (SCC) to remove particles larger than 2.5 μm. The inlet selectively transmits airborne particles according to the EPA's PM2.5 criteria. After exiting the inlet tube, the aerosol moves cyclonically within the body of the cyclone where the larger particles are transported due to their inertia against the outer wall. The curvatures of the cyclone body causes particles to inertialy move towards the outside wall and migrate into the collection or grip cup to be disposed.

29.10.3.1.2 Multicell Denuder

Denuders consist of tubes of annular spaces that capture reactive gases while allowing the particles to penetrate. Gases have a large diffusion coefficient, and their random motion brings them into contact with the walls of the denuder. With appropriate coatings or selection of the denuder material, semi-volatile vapors are captured by the denuder walls. The particles follow the airflow stream lines, and pass through the denuder without contacting the walls. The particles penetrate the denuder and are captured by a filter placed downstream of the denuder. The filter medium is selected so that it adsorbs vapors from any subsequent volatilization of the collected particles.

The SuperSASS utilizes a nitric acid denuder. It is an aluminum hexagonal cell material, coated with Magnesium oxide. There are approximately 350 hexagonal channels, each approximately 1.6 mm diameter. Each denuder is 25 mm long.

29.10.3.1.3 Filter Media

The SuperSASS collects samples on 47 mm filters at the standard flow rate of 6.7 LPM. The filter support screens are manufactured to the same specifications as those for the Federal Reference Method PM2.5 sampler. Several types of filter media are needed for assaying the different chemical constituents of ambient particles:

- Teflon – used for non-volatile gravimetic mass and trace metals
- Nylon – used for semi-volatile constituents such as nitrates and sulfates
- Quartz – used for total organic carbon and elemental carbon

29.10.3.2 Receiving Samples

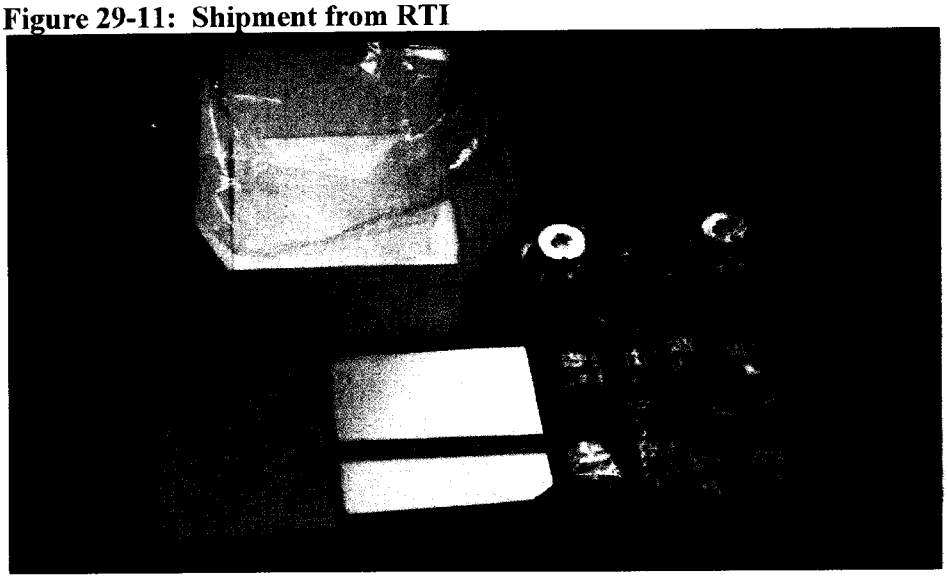
As part of the EPA project to monitor PM2.5 particulate, modules, denuders, and spare parts are sent to the EPA contractor in charge of filter analysis. They will by cycled around on a regular basis to collect filter data. All materials for collection of samples, chain of custody, and transport cooler will be provided by the EPA contractor. The EPA contractor responsible for Polk County's speciation sample handling is: Research Triangle Institute (RTI), 1000 Parliament Court, Suite 100, Room 152, Durham, NC 27703. In case of problems, contact Jim O'Rourke at 919-541-8996.

29.10.3.2.1 Samples Received from RTI

RTI will provide a set of 3 prepared modules for each sample collection day. The modules are prepared according to EPA test configurations. The first module contains a Teflon filter for sampling trace metals. The second module contains an MgO denuder and a nylon filter for sampling cations, nitrates and sulfates. The third module contains a quartz filter for sampling organic and elemental carbon.

Figure 29-11 shows everything received from RTI including: 8 ice packs, the 3 sample modules, the CAFDF, shipping container, and packing lid.

Figure 29-11: Shipment from RTI



29.10.3.2.2 Samples Received from UHL

UHL will provide one sample module to be placed in the 4th channel. This module contains an MgO denuder and a nylon filter for sampling nitrates and sulfates. Included will be the chain-of-custody with the assigned sample collection day, and ice packs for the return shipment.

29.10.3.3 Chain of Custody Data Forms

The Chain of Custody (COC) Forms contain important information required for the proper analysis of PM2.5 Speciation Samples. This is often the only form of communication between

Polk County and contract agencies. The Polk County Air Quality personnel responsible for the sample collection, is also responsible for filling out the COC forms accurately and completely to help maintain sample integrity.

29.10.3.3.1 Chain of Custody for RTI

The Custody and Field Data Form (CAFDF) number will be unique to each sample set and assigned in advance by the laboratory for RTI, Form 5, Appendix A. The 2-part carbonless form will be distributed as follows:

White original – returned to the analytical laboratory
Yellow – retained by the field site office

Acknowledge receiving and relinquishing custody in the Custody Record section. Record your name and date. Information about the site and the date the sampler modules are to be used. Most of this information will be pre-entered by the laboratory. The sampling components needed for a particular sampler and its multi-channel sampling arrangement are listed in the Sampler Channel Components section. They are identified by bar code tracking number and by a free-form description. The brand of sampler is identified here. This information will be entered by the laboratory, preprinted on the form. A separate custody/data form will be used for each set of sampling modules. Enter the Start, End and Retrieval Times. The start and end times correspond to those programmed into the sampler during the setup phase. The retrieval date and time indicate when the sampling modules were removed form the sampler. Post-sampling information can be transcribed by hand, directly from the display screen of the sampler. The operator is responsible for making these entries at the site. The volumes will be used by the laboratory to compute analyte concentrations. Record any further notes or observations in the Comment section.

29.10.3.3.2 Chain of Custody for UHL

The Chain of Custody data form for UHL is a much simpler form, Form 6, Appendix A. Acknowledge receiving custody of the sample. Enter the start and end dates, and the run time of the sample. Enter the sample volume and flow rate. Record any further comments or observations in the Note Section. Send the data file in excel format via of e-mail to UHL's contact, see Section 29.10.3.6 for directions on downloading the data file.

29.10.3.4 Sampler Setup

Record information about the sample on an individual $PM_{2.5}$ Custody and Field Data Form (CAFDF). Remove the yellow protective end caps from the modules (canisters). Attach a dedicated sharp cut cyclone (SCC) to each module. Install loaded filter modules in predetermined (color-coded) sampling channel locations according to the information given on the CAFDF sent from the support laboratory. Place module caps in a clean plastic bag and store for later use to seal used modules for return to the laboratory.

From the Home Menu, press the **Setup** button. Press the **F1** button and then press the **Add** button. Use the arrow keys to correctly enter in the Start Date and Time. The left and right arrow will advance across the screen and the up and down arrows will allow you to change numbers. The start time is always midnight (0:00) and the event length is 24 hours. Select the

Add button to save the programmed event. Press the **Exit** button to return to the Setup Menu. Press the **F1** button to review the programmed event, and then select the **Exit** button. Make entries to the CAFDF. Press the **Exit** button to return to the Home Menu.

29.10.3.4.1 Field Blank Filters

The frequency of Field blanks will be recommended by the $PM_{2.5}$ Chemical Speciation Network Quality Assurance Project Plan. Load field blank modules every 10 sampling days. Do not activate flow to field blank channels. Filter blanks are to be used during the same time interval as the routine sample cassettes. Install the field blank modules with the SCCs in the channel locations as indicated by the CAFDF form. After a minute or two, remove the field blank modules from the sampler, detach the cyclones, cap the cassettes, and return them to their spot in the shipping bin or cooler.

29.10.3.4.2 Trip Blank Filters

The frequency of Trip blanks will be recommended by the $PM_{2.5}$ Chemical Speciation Network Quality Assurance Project Plan. Trip blanks are used to measure possible contamination to filters during transportation to and from sampling locations. They provide a frame of reference in case field blanks exhibit mass gain higher than the tolerance levels. Trip blanks should remain inside their protective bags and never be exposed to sampling procedures. Trip blanks account for have been historically issued at a rate of approximately 5% of all routine filters issued by the contractor laboratory support. Trip Blanks are designated by the weighing laboratory and issued at random. However, trip blanks should be used in conjunction with field blanks.

29.10.3.5 Pick Up Procedure

At the end of the sample run, lower the sampler's lower radiation shield. Rotate each module counterclockwise to remove it from its sampling position. Remove the cyclone. Cap the module inlet and outlet with yellow end caps. Place or store the cyclones in a clean spot. Reinstall cyclones on the modules for the next sampling run.

NOTE: It is highly recommended that sampling modules be removed from the sampler within 48 hours after the sampling period ends. If this is not possible, data will be flagged, but not voided.

Samples must be cooled to <4°C as soon as possible after removal from monitor. Samples will be stored at <4°C, and returned in the RTI and UHL provided coolers on the requested shipping date. All field data sheets must be filled out completely.

29.10.3.6 Post Sampling Verification and Data Retrieval

Select the **Event** button option from the Home Menu. Press the **F1** button for current event status data. Record END date/time, sample retrieval date/time, specified post-sampling information, and free-form comments on the CAFDF. Use the ">>" and "<<" keys to advance through the menus to record data. **Please double-check entries and write clearly!** Press the **Exit** button to return to Setup Menu. Press the **Exit** button to return to Home Menu. If necessary, download sampler data from RS-232 port to laptop computer or to Met One SuperSASS data transfer module. Retain data disk file for later use in data validation. Do not ship it to the support laboratory. Select the **Exit** button to complete the data retrieval.

29.10.3.6.1 Data Transfer Module

The UX-961 Data Transfer Module manufactured by Met One Instruments provides an easy way to gather data from the SuperSASS. The following accessories are required for data acquisition:

- 3498 SASSCommAQ Ver. 4.0.2 Met One Instruments Environmental Software
- 3169-Cable assembly with one four pin circular connector and one DB-9 (male) connector
- 9070-Cable assembly with two DB-9 connectors (one male, one female)
- 3288 AC Power Adapter

To collect data from the SuperSASS Sampler, connect the Data Transfer Module to the instrument using the 3169-cable assembly. On the main screen of the SuperSASS control box, press the **Transfer Data** button on the menu. Select either **Transfer History** or **Transfer All** to initiate the transfer of Data. "Transfer History" will transfer data from only the previous run, and will be used under most conditions. "Transfer All" will transfer all the data currently saved in the SuperSASS monitor. The SuperSASS will archive up to twenty-four post events in a circular manner for which the oldest is overwritten by the newest addition. When the data transfer is complete, press the **Exit** button to get back to the main menu.

NOTE: The Data Transfer Module will automatically over-write past data every time it is used. "Transfer All" can be used to retrieve past data if data is lost prior to saving it to a PC computer.

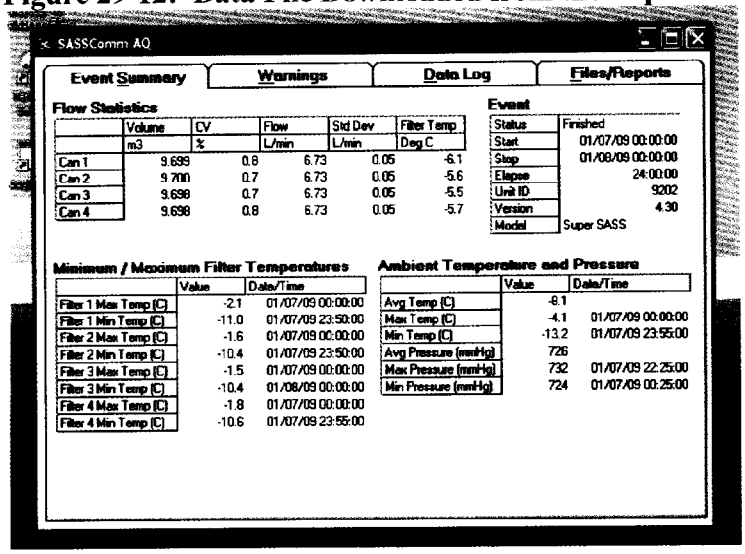
The 3498 SASSCommAQ Environmental Software will be used to transfer data from the Data Transfer Module to a PC computer file. To transfer the data from the Data Transfer Module to a PC computer, connect the female end of the 9070-cable assembly to the RS232 Serial Port located on the back of the PC computer. A separate power adapter module is required to power the Data Transfer Module. The power adapter module connects to the 9070-cable assembly, and then needs to be plugged in to a power supply.

NOTE: All connections should be done while the PC computer is off.

Once everything is connected, connect the male end of the 9070-cable assembly to the Data Transfer Module. Open the 3498 SASSCommAQ Environmental Software. Press the **Retrieve Data** button. When the data transfer is complete, the data can be viewed in the screen displayed in Figure 29-12. To access data in Excel format, go to: C:\Program Files\SASSCommAQ V4\Data. The data is automatically saved to this location on the computer.

For a more detailed explanation for procedures to download data from the SuperSASS using the Data Transfer Module, refer to Met One Instruments "UX-961 Data Transfer module Operations Manual".

Figure 29-12: Data File Downloaded from the SuperSASS



29.10.3.6.2 Laptop Computer

Although the Data Transfer Module is the preferred method of data transfer, a laptop computer may also be used. The following accessories are required for data acquisition:

- 3498 SASSCommAQ Ver. 4.0.2 Met One Instruments Environmental Software
- 3169-Cable assembly with one four pin circular connector and one DB-9 (male) connector
- Belkin F5U109 USB-to-RS232 Serial Adapter

To collect data from the SuperSASS Sampler, connect the laptop computer to the instrument using the 3169-cable assembly and a Belkin Serial Adapter. The 3498 SASSCommAQ Environmental Software will be used to transfer data from the SuperSASS Sampler to a laptop computer. Open the 3498 SASSCommAQ Environmental Software, and press the **Retrieve Data** button. On the main screen of the SuperSASS control box, press the **Transfer Data** button on the menu. Select either **Transfer History** or **Transfer All** to initiate the transfer of Data.

When the data transfer is complete, press the **Exit** button on the SuperSASS to get back to the main menu. The data can be viewed on the laptop computer in the screen displayed in Figure 29-12. To access data in Excel format, go to: C:\Program Files\SASSCommAQ V4\Data. The data is automatically saved to this location on the computer.

29.10.3.7 Post Sampling Filter Handling

29.10.3.7.1 Field Transportation

Using a cooler filled with 3-5 blocks of blue ice, place exposed filter modules inside cooler. Ensure that filters remain as cool as possible and that the cooler is opened as little as possible.

29.10.3.7.2 Cold Storage

Upon arrival at laboratory with exposed filters, quickly transfer the filter modules to the freezer and close the door. Return the blue ice from cooler to the freezer.

29.10.3.7.3 Freezer Temperature Tracking

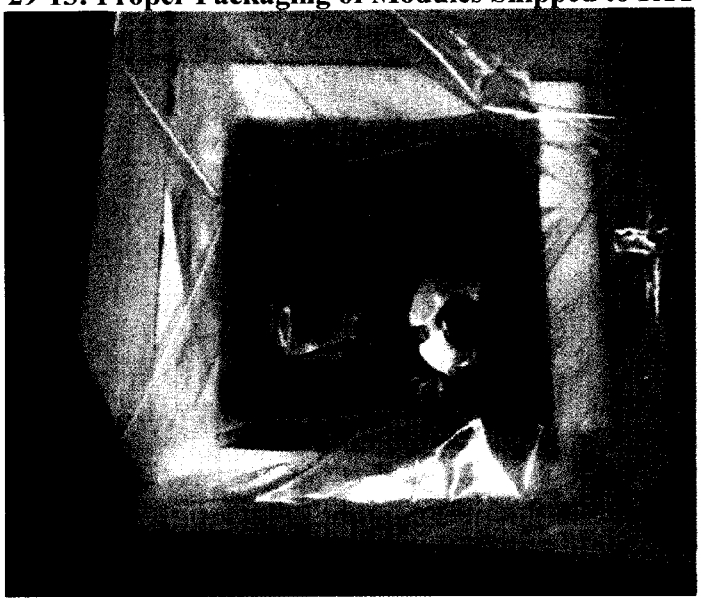
On a daily basis, the maximum temperature (°C) should be recorded in the appropriate X and R Bar Chart Logbook. Press the <MAX> button located on the lower right hand corner of the thermometer located on the front of the refrigerator/freezer. When "Max" is displayed on the upper left hand corner of the thermometer, the maximum temperature is displayed on the top line. This temperature indicates the maximum temperature of the freezer during the period in which the thermometer was last reset. Record the date, maximum temperature and technician initials in the X and R bar chart. Should the temperature of the refrigerator/freezer ever exceed 4.0°C, the preparation laboratory should be notified of the exceedance. This will allow them proper time to condition and weigh the exposed filters when they receive them.

29.10.3.8 Shipment of Samples

29.10.3.8.1 Samples Shipped to RTI

RTI will provide a specific schedule for days of shipment, typically within 96-hours of the sampling event. It is important to follow RTI's Shipping Schedule. If a shipment is missed, ship the sample as soon as possible. For temperature control, samples must be received by RTI within 24-hours of shipment. Do not ship on Fridays. All shipments are made using FedEx Express. RTI will provide all necessary FedEx forms. Figure 29-13 shows the modules and ice packs placed in the shipping box. The CAFDF will be placed in a sealable plastic bag and placed on top of the modules and ice packs. The insulated top in placed on top and the box is sealed with tape and sent by Fed-Ex to the support laboratory.

Figure 29-13: Proper Packaging of Modules Shipped to RTI



29.10.3.8.2 Samples Shipped to UHL

The 4th Channel module should be transported weekly to UHL's Laboratory in Iowa City by way of Courier service. Typically, this module will be shipped on the same day modules are shipped to RTI. Polk County's drop off and pick up location for the Courier service is the UHL laboratory located on DMACC's Campus. It is Polk County Air Quality Personnel's responsibility to prepare the module for shipment and deliver them to the UHL laboratory located on DMACC's Campus.

The module must be shipped in ice packed coolers. Open the lid to the supplied cooler. Place module in cooler and surround with ice packs. Be sure to relinquish all necessary chain of custody forms that have been signed with initials, date and time. Place these sheets inside the cooler.

29.11 Data Validation

29.11.1 Data Validation by RTI

The monthly data reports prepared by RTI include data that has been analyzed, entered and validated, together with the validation flags and codes for each item. Data that has been previously reported will not be resubmitted unless reprocessing and reapproval is required for some reason. Data reports are organized by exposure sample, flow channel, analysis, and individual analyte. Accompanying each data reports is a spread sheet that reports all measurement values and associated validation flags. Validation flags shown in the monthly data reports fall into three general categories:

- **Null Value Code in AIRS** - This data is completely invalid and null value code completely overwrites the numerical value (Table 29-3).
- **Validity Status Code in AIRS** - This data is considered to be questionable, but not invalid. Validity Status Codes do not overwrite the numerical value (Table 29-4).

- **Informational Flags not reported to AIRS** – This data may be used to prompt further investigation by the states. For example, Level 1 flags showing an unusual mass balance or cation/anion ratio at a particular site might prompt the agency to investigate sample handling procedures.

RTI posts monthly data reports on website within 30 days of sample receipt. Polk County Ambient Air Quality Personnel reviews data reports and provides validation feedback within 45 days. RTI includes validation feedback and uploads to AIRS within 15 days.

29.11.2 Data Validation by UHL

Currently, there are no data validation procedures for Polk County via UHL.

29.11.3 Data Validation by Polk County Ambient Air Quality Personnel

Polk County Ambient Air Quality Personnel first assess and review the data and validation flags that have been applied by RTI. Data is entered into a spreadsheet that performs the following tests:

- **Sum Recovered Mass** – The weights of all individual species are added up and compared to the total mass of the filter.
- **Mass Balance** – The sum of the concentration of each analyte divided by the total concentration. This value should be equal to the value for the sum recovered mass. The acceptance range is 0.6 to 1.32.
- **Sulfur/Sulfate Mass Ratio Test** – It is assumed that most sulfur will be present as sulfate. If 100% of the sulfur was in the form of sulfate, then the ratio would be 33%. The acceptable range is 25 to 45%.
- **Ion Balance** – The ratio of negative to positive charges. The acceptance range is 0.86 to 2.82.
- **% Difference** - The total mass on Teflon filter of speciation sampler is compared to the total mass obtained by an FRM PM2.5 sampler from the same day.

If there is a disagreement with any validation criteria or data values, the specific changes are passed back to RTI to be corrected before the data is uploaded to AIRS. If the speciation data passes all tests, Polk County Ambient Air Quality Personnel then need to apply additional validation criteria based on knowledge of the site conditions, calibration results, audit reports, etc. Results of additional screening are passed back to RTI using the Data Review and Change Submission Form (DRCSF), Form 7, Appendix A.

Table 29-3: AIRS Null Value Codes

AIRS NULL VALUE CODES

AA	9967	SAMPLE PRESSURE OUT OF LIMITS
AB	9968	TECHNICIAN UNAVAILABLE
AC	9969	CONSTRUCTION/REPAIRS IN AREA
AD	9970	SHELTER STORM DAMAGE
AE	9971	SHELTER TEMPERATURE OUTSIDE LIMITS
AF	9972	SCHEDULED BUT NOT COLLECTED
AG	9943	SAMPLE TIME OUT OF LIMITS
AH	9974	SAMPLE FLOW RATE OUT OF LIMITS
AI	9975	INSUFFICIENT DATA (CAN'T CALCULATE)
AJ	9976	FILTER DAMAGE
AK	9977	FILTER LEAK
AL	9978	VOIDED BY OPERATOR
AM	9979	MISCELLANEOUS VOID
AN	9980	MACHINE MALFUNCTION
AO	9981	BAD WEATHER
AP	9982	VANDALISM
AQ	9983	COLLECTION ERROR
AR	9984	LAB ERROR
AS	9985	POOR QUALITY ASSURANCE RESULTS
AT	9986	CALIBRATION
AU	9987	MONITORING WAIVED
AV	9988	POWER FAILURE (POWR)
AW	9989	WILDLIFE DAMAGE
BA	9990	MAINTENANCE/ROUTINE REPAIRS
BB	9994	UNABLE TO REACH SITE
BC	9995	MULTI-POINT CALIBRATION
BD	9996	AUTO CALIBRATION
BE	9997	BUILDING/SITE REPAIR
BG	9966	MISSING OZONE DATA
BI	9964	LOST OR DAMAGED IN TRANSIT

Table 29-4: AIRS Validation Status Codes

AIRS VALIDATION STATUS CODES	
A	HIGH WINDS
C	VOLCANIC ERUPTIONS
D	SANDBLASTING
E	FOREST FIRE
F	STRUCTURAL FIRE
G	HIGH POLLEN COUNT
H	CHEMICAL SPILLS & INDUST. ACCIDENTS
I	UNUSUAL TRAFFIC CONGESTION
J	CONSTRUCTION/DEMOLITION
K	AGRICULTURAL TILLING
L	HIGHWAY CONSTRUCTION
M	REROUTING OF TRAFFIC
N	SANDING/SALTING OF STREETS
O	INFREQUENT LARGE GATHERINGS
P	ROOFING OPERATIONS
Q	PRESCRIBED BURNING
R	CLEAN UP AFTER A MAJOR DISASTER
S	SEISMIC ACTIVITY
T	MULTIPLE FLAGS; MISC.
W	FLOW RATE AVERAGE OUT OF SPEC.
X	FILTER TEMPERATURE DIFFERENCE OUT OF SPEC.
Y	ELAPSED SAMPLE TIME OUT OF SPEC.

29.11.4 Data Review and Change Submission Form

The Data Review and Change Submission Forms (DRCSF) are used to transmit changes in validation from Polk County to the Delivery Order Project Officer (DOPO) at RTI. Brief instructions on filling the form are given below. These instructions describe the columns on the Data Review and Change Submission Form used to transmit changes in validation flags from Polk County to the DOPO at RTI prior to submission of data to AIRS. Brief instructions on filling out each section of the Change Submission Form are given below:

- **Header** – Fill out the material in the header completely. It is very important to know the date of the original report. Pages after the first should be numbered sequentially.
- **Chain of Custody ID Number** – This is the number that uniquely identifies the set of filters exposed at a particular site, on a particular date. This number is critically important for identifying the correct data. If this number is incorrect in the data report, contact RTI at once.
- **Analysis** – This is the name of one or more analyses that are to be changed:
  Anions and cations by ion chromatography (IC)
  Organic and elemental carbon, includes total and carbonate carbon (OC/EC)
  Total mass
  Elemental analysis by X-ray Fluorescence (XRF)

  If all analyses for the exposure session are equally affected by the change, write "all".
- **Analytes** – This is the name of one or more analytes to be changed. If all the analytes for an analysis receive the same change, write "all". If only cations are affected for and IC analysis, write "cations" only. For nitrate, specify which type of nitrate (particulate, volatile, etc.). Otherwise, all nitrate analyses will be flagged the same way.
- **Data Flag(s)** – This is divided into two columns, Delete and Add. Under Delete, list the flags that are to be deleted or over-written by a flag to be added. Under Add, list the flag that is to be inserted. All added flags must be valid AIRS NULL Value Codes or Validity Status Codes. The table of all AIRS codes defined for PM2.5 chemical speciation is listed in Table 29-3 and 29-4.
- **Comment** – The comment is not reported to AIRS. However, it is important to explain the reason for a change in case RTI QA and data entry personnel have any questions. Having the comments on file will also facilitate answering question from EPA and other data users.

All corrections, changes, and questions should be communicated to RTI through the Delivery Order Project Officer (DOPO), Patricia Schraufnagel. Her e-mail, Schraufnagel.Patricia@epamail.epa.gov, can be used to communicate minor changes. A correction form should be used for major changes.

Appendix A – Critical Forms and Field Sheets

Form 1 - Audit Field Sheet

$PM_{2.6}$ SUPERSASS QUARTERLY AUDIT FORM

A. SITE AND SAMPLER INFORMATION

Site Name:	Date/Quarter:
Site Location:	Time:
Technician's Name:	Sampler ID:
Observer's Name:	Sampler Model: SuperSASS

B. DATE AND TIME CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sample display date/time	Transfer standard date/time	Date/time agree ± 5 min?

C. LEAK CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Channel number	Manufacturer's specification met? (less than 0.1 L/min)	Action taken and recheck results
1		
2		
3		
4		

D. AMBIENT TEMPERATURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (° C)	Transfer standard (° C)	Agreement ± 2°C?	Action taken and recheck results
Ambient				

D. FILTER TEMPERATURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (° C)	Transfer standard (° C)	Agreement ± 2°C?	Action taken and recheck results
Filter 1				
Filter 2				
Filter 3				
Filter 4				
Filter 5				
Filter 6				
Filter 7				
Filter 8				

E. PRESSURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (mm Hg)	Transfer standard (mm Hg)	Agreement ± 10 mm Hg?	Action taken and recheck results
Ambient				

F. FLOW RATE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Channel number	Sampler display (L/min)	Transfer standard (L/min)	Design flow rate (L/min)	Agreement ± 10 %? Samp./Std.	Agreement ± 10 %? Samp./Design	Action taken and recheck results
1			6.7			
2			6.7			
3			6.7			
4			6.7			

G. COMMENTS:

Form 2 – Calibration Field Sheet

$PM_{2.5}$ SUPERSASS ANNUAL CALIBRATION FORM

A. SITE AND SAMPLER INFORMATION

Site Name:	**Date:**
Site Location:	**Time:**
Technician's Name:	**Sampler ID:**
Observer's Name:	**Sampler Model: SuperSASS**

B. DATE AND TIME CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sample display date/time	Transfer standard date/time	Date/time agree ± 5 min?

C. LEAK CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Channel number	Manufacturer's specification met? (less than 0.1 L/min)	Action taken and recheck results
1		
2		
3		
4		

D. AMBIENT TEMPERATURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (° C)	Transfer standard (° C)	Agreement ± 2°C?	Action taken and recheck results
Ambient				

D. FILTER TEMPERATURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (° C)	Transfer standard (° C)	Agreement ± 2°C?	Action taken and recheck results
Filter 1				
Filter 2				
Filter 3				
Filter 4				
Filter 5				
Filter 6				
Filter 7				
Filter 8				

E. PRESSURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (mm Hg)	Transfer standard (mm Hg)	Agreement ± 10 mm Hg?	Action taken and recheck results
Ambient				

F. FLOW RATE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Channel number	Sampler display (L/min)	Transfer standard (L/min)	Design flow rate (L/min)	Agreement ± 10 %? Samp./Std.	Agreement ± 10 %? Samp./Design	Action taken and recheck results
1			6.7			
2			6.7			
3			6.7			
4			6.7			

G. COMMENTS:

Form 3 - Verification Field Sheet

$PM_{2.5}$ SUPERSASS MONTHLY VERIFICATION FORM

A. SITE AND SAMPLER INFORMATION

Site Name:	**Date:**
Site Location:	**Time:**
Technician's Name:	**Sampler ID:**
Observer's Name:	**Sampler Model: SuperSASS**

B. DATE AND TIME CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sample display date/time	Transfer standard date/time	Date/time agree ± 5 min?

C. LEAK CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Channel number	Manufacturer's specification met? (less than 0.1 L/min)	Action taken and recheck results
1		
2		
3		
4		

D. AMBIENT TEMPERATURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (° C)	Transfer standard (° C)	Agreement ± 2°C?	Action taken and recheck results
Ambient				

D. FILTER TEMPERATURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (° C)	Transfer standard (° C)	Agreement ± 2°C?	Action taken and recheck results
Filter 1				
Filter 2				
Filter 3				
Filter 4				
Filter 5				
Filter 6				
Filter 7				
Filter 8				

E. PRESSURE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Sensor location	Sampler display (mm Hg)	Transfer standard (mm Hg)	Agreement ± 10 mm Hg?	Action taken and recheck results
Ambient				

F. FLOW RATE CHECKS

Transfer Standard Name _____ Transfer Standard ID Number _____

Channel number	Sampler display (L/min)	Transfer standard (L/min)	Design flow rate (L/min)	Agreement ± 10 %? Samp./Std.	Agreement ± 10 %? Samp./Design	Action taken and recheck results
1			6.7			
2			6.7			
3			6.7			
4			6.7			

G. COMMENTS:

Form 4 - Polk County Corrective Action Form

To: _____ Polk County Air Quality _____
(position)

From: _____

Copies of completed form to: AQ Supervisor, File

Urgency: ☐ Emergency (immediate action needed) ☐ Urgent (24 Hr.)

☐ Routine (7 days) ☐ Next scheduled visit ☐ Information only

Problem Identification:

Site: _____
System: _____
Date: _____

Description of Problem: _____

Recommended Action: _____

Signature of Initiator: _____ Date: _____

Problem Resolution:

Date of Corrective Action: _____

Summary of Corrective Action: _____

Result of Corrective Action: _____

Signature of resolver: _____ Date: _____

Signature of QA Officer: _____ Date: _____

Form 5 - Custody and Field Data Form (CAFDF)

BAR CODE GOES HERE Custody/Data Form No.	**$PM_{2.5}$ STN CUSTODY AND FIELD DATA FORM**	White – return to lab Yellow – site retains Pink – lab retains

. CUSTODY RECORD (Name, Date)

1. Laboratory, Out
2. Site, In
3. Site, Out _____
4. Lab, In _____

B. SITE AND SAMPLER INFORMATION

1. Site AIRS Code
2. Sampler S/N ____
3. Sampler Type ____
4. Sampler POC ____
5. Site Name _____
6. Intended date of use _____
7. Date of sampler set-up _____
8. Operator's name __

C. SAMPLER CHANNEL COMPONENTS

Channel Number	Component ID No.	Component Description
1	kept at site	SASS cyclone
1	11234568	SASS cassette (Teflon filter) (GREEN)
2	kept at site	SASS cyclone
2	11234570	SASS cassette (MgO denuder, nylon filter) (RED)
3	kept at site	SASS cyclone
3	11234572	SASS cassette (quartz filter) (ORANGE)

D. START, END, AND RETRIEVAL TIMES

Channel No.	Start date	Start time	End date	End time	Retrieval date	Retrieval time
1						
2						
3						

E. SAMPLER CHANNEL INFORMATION (Post-Sampling)

Channel No.	Run Time	Run Time, Flag	Sample Volume (m3)	Avg. flow (L/min)	Avg. flow CV (L/min)	Avg. ambient T (□C)	Max. ambient T (□C)	Min. ambient T (□C)
1								
2								
3								

Channel No.	□T Flag	Avg. Filter T (□C)	Max. Filter T (□C)	Min. Filter T (□C)	Avg. BP (mm Hg)	Max. BP (mm Hg)	Min. BP (mm Hg)
1							
2							
3							

Form 6 - Chain of Custody for UHL

		Initial
Prepared By:	9/6/2007	QO
Date Sent Out:	9/6/2007	QO
Date Received:	9/7/07	SK
Filter ID:	090907PC	QO
Run Date:	9/9/2007	QO
Actual Run Date:	9/9/07	SK
End Date:	9/10/2007	QO
Actual End Date:	9/10/07	SK
Total Volume:	14.377 m3	SK
Flow Rate:	10 L/min	
Run Time:	23:59 Hrs	
Files E-mailed:	(Y) N	SK

Notes:

Form 7- Data Review & Change Submission Form for RTI

Chemical Speciation Trends Network
Data Review and Change Submission Form

Monitoring Agency Name _____ Date of Original Report _____ Page ____ of ____

Reviewed by _____ Review Completed, Date _____

Instructions: Please indicate changes to be made before the data are submitted to AIRS. Only valid AIRS Null Value or Status Codes can be accepted. Alternative formats such as spreadsheet files may also be acceptable. Return this form to RTI through the DOPO.

Chain of Custody ID Number	Analysis	Analyte(s)	Data Codes(s)		Comment (optional)
			Delete	Add (see table)	

Monitoring Agency Name _____ Date of Original Report_____

Reviewed by _____ Review Completed, Date_____

Instructions: *Please indicate changes to be made before the data are submitted to AIRS. Only valid AIRS Null Value or Status Codes can be accepted. Alternative formats such as spreadsheet files are acceptable. Return this form to RTI through the DOPO.*

COC ID	Analysis	Analyte(s)	Data Codes(s)		Comment (optional)
			Delete	Add (see table)	
Q1234V	elements (XRF), mass	all		AH	Channel 1 flow rate sensor was seriously out of calibration during internal audit on 3/15/2000. All data for channel retroactively invalidated.
Q3245R	all analyses, all filters	all		K	Operator noted agricultural tilling in the area, which may explain high loadings on all filters for this sample exposure.
Q5432M	all analyses, all filters	all		AQ	Internal Systems Audit found the site operator to be using improper filter handling procedures. All samples handled by this operator are invalidated.
Q9993A	XRF, mass	all elements, mass		AM	The reported masses indicate that this filter module may have been interchanged with a trip blank that was used at the same time (Q1877Y).
Q4988J	all	all	AI	--	Volume data omitted from the original COC form has been supplied to RTI. Recalculate PM concentrations and remove AI null value code.
Q1112U	all	all	AM	change to T	Shipment was received by the lab at 8°C and all data was marked Invalid (AH). EPA has granted a waiver to change this to status code T. (multiple/misc.) flags).
Q2233M	XRF	all elements		AM	Elemental XRF results failed Level 2 outlier tests at $p<0.001$ when compared with other samples taken at this site.
Q1004H	IC	nitrate		T	Nitrate data failed Level 2 outlier tests at $p<0.01$. Other analytes appear to be OK. The lab should review the nitrate data.
Q4657P	IC	anions, cations, nitrate		T	Site audit found that this Channel was being used without the required MgO denuder.
Q5555T	OC/EC	all carbon species		E	All carbon species were outliers at $p<0.01$ in Level 2 validation. There was a forest fire approximately 30 miles upwind.

March 12, 2014

Wednesday

March 2014

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

April 2014

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

12 Wednesday

7 am

Dave Williamson
Conference Rm B

8 00

9 00

10 00

11 00

12 pm

1 00

Preconstruction Mtg. - NE 112 St & HWY 163
Conf. Room C

2 00

3 00

4 00

5 00

6 00

Notes

March 12, 2014

Wednesday

March 2014

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

April 2014

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

	12 Wednesday
7 am	
	Dave Williamson Conference Rm B
8 00	
9 00	
10 00	
11 00	
12 pm	
1 00	**Preconstruction Mtg. - NE 112 St & HWY 163** Conf. Room C
2 00	
3 00	
4 00	
5 00	
6 00	

Notes